September

MODERN MECHANIX

HOBBIES AND INVENTIONS

NOW 15¢

GERMAN PADDLE PLANE
SEE PAGE 68

Training Army Air Fighters by Brig. Gen. Arnold

Gar Wood Predicts Startling Boat Speeds

SEPT. 1936

MODERN MECHANIX HOBBIES AND INVENTIONS

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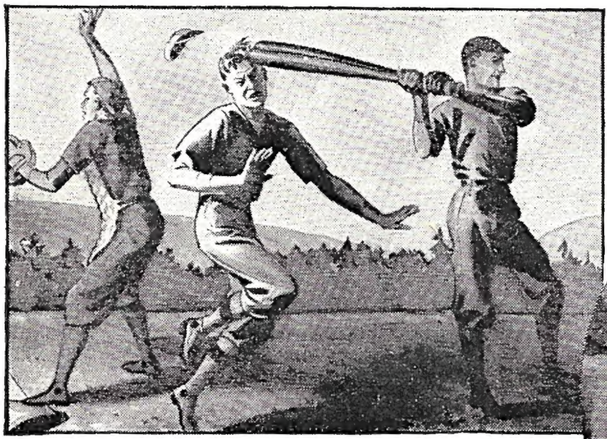
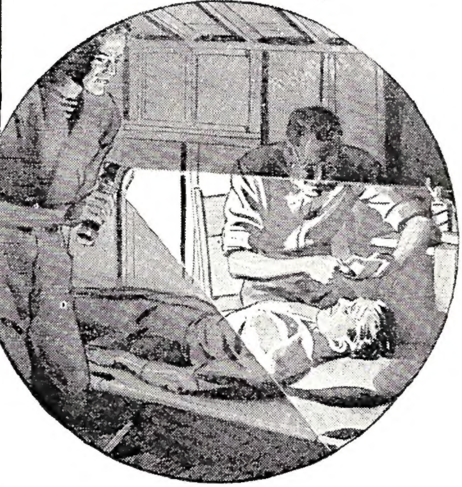
Safe at the Plate....



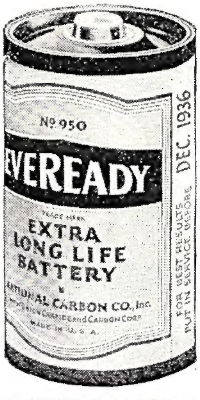
....*a casualty ten feet beyond*



His Head Cut Open Harold Genesen Rushed to Camp Hospital Where Lights Fail

We have a "twilight league" at our summer camp. One time, when I was on second base and a teammate made a hit, I dashed for home, thinking of nothing but how badly we needed another run.

I crossed the plate breathless and ran smack into a bat a fellow was swinging carelessly. It laid open a deep wound along my eyebrow, so they took me to the doctor's cabin. It was getting dusk and the camp electric plant was out of order, so the doctor told the boys to bring flashlights. We all had them, of course, but only one boy had one bright enough for the doctor to use. It was an Eveready Boy Scout. And the fellow who owned it said it was brighter because he had real, fresh Eveready Batteries in it and not just any old kind. That accident showed me that just having a flashlight isn't enough . . . you've got to have good fresh Eveready Batteries in it . . . if you are going to live up to the Scout motto: "Be Prepared."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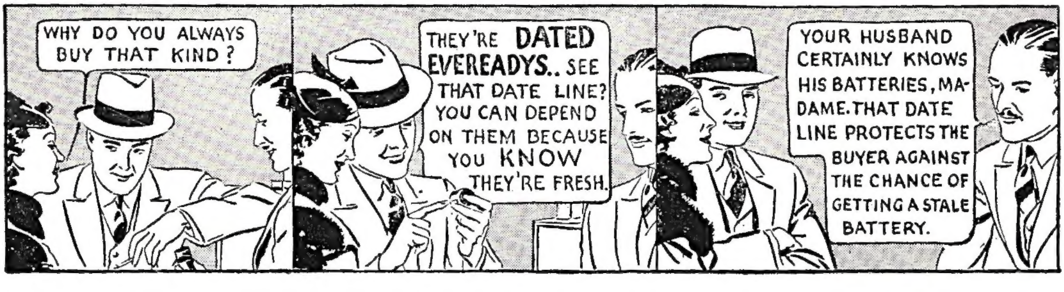
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Many make $30 $50 $75 a week

I will train you at home for many Good Spare Time and Full Time Radio Jobs

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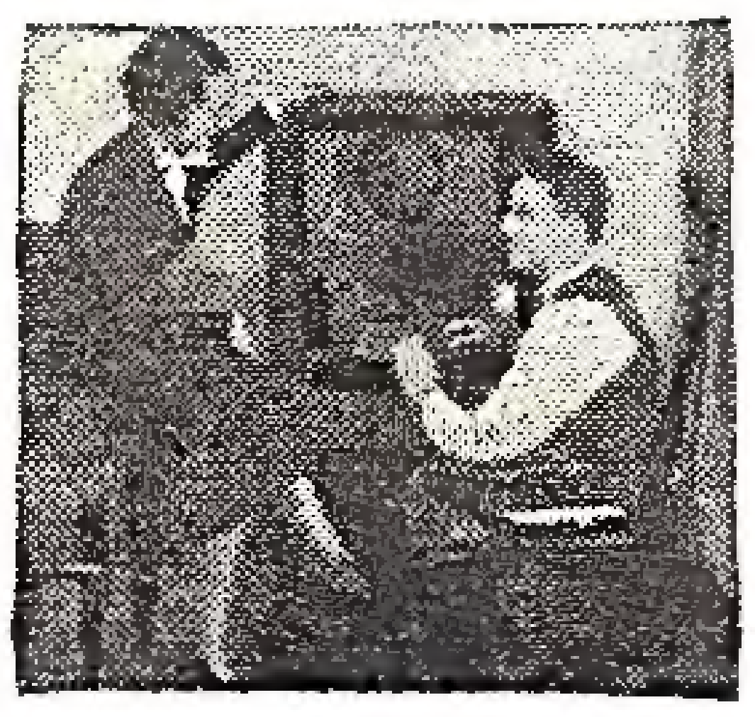
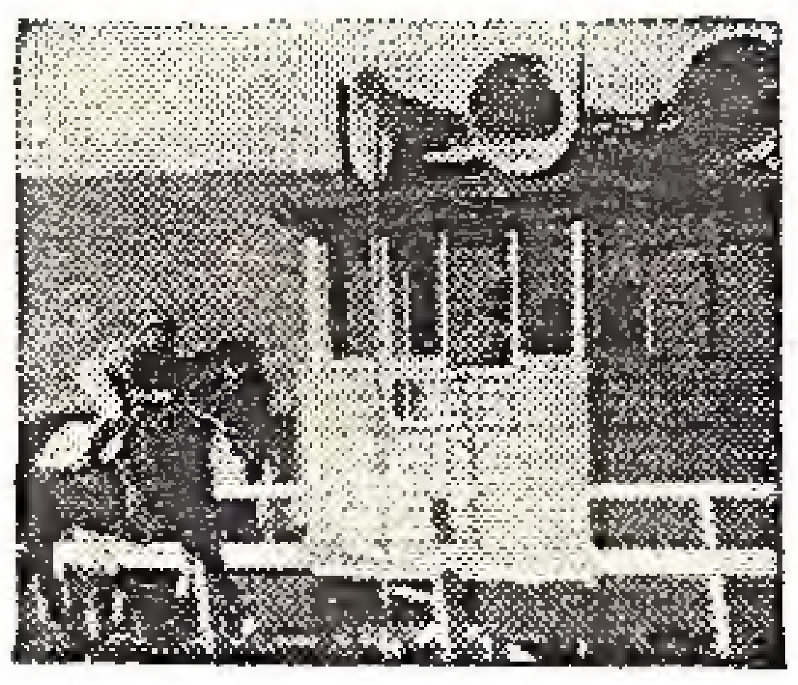
Employ managers, engineers, operators, installation and maintenance men for fascinating jobs and pay up to $5,000 a year.

Set Servicing



Spare time set servicing pays many $5, $10, $15 a week extra while learning. Full time servicing pays as much as $30, $50, $75 a week.



Loud Speaker Systems

Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio.

HERE'S PROOF THAT MY TRAINING PAYS

$80 Monthly in Spare Time

"I work on Radio part time, still holding my regular job. Since enrolling five years ago, I have averaged around $80 every month." JOHN B. MORISSETTE, 778 Silver Street, Manchester, N. H.

Makes $50 to $60 a Week

"I am making between $50 and $60 a week after all expenses are paid, and I am getting all the Radio work I can take care of, thanks to N. R. I." H.W. SPANGLER, 306 Walnut St., Knoxville, Tenn.

Operates Public Address System

"I have a position with the Los Angeles Civil Service, operating the Public Address System in the City Hall Council. My salary is $159 a month." R.H.ROOD, R. 136, City Hall, Los Angeles, Calif.

Do you want to make more money? Radio offers you many opportunities for well-paying spare time and full time jobs. And you don't have to give up your present job or leave home and spend a lot of money to become a Radio Expert.

Many Radio Experts Make $30, $50, $75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as $30, $50, $75 a week. Many Radio Experts operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay and see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I have trained are holding good jobs in these branches of Radio. Read their statements. Mail the coupon.

There's a Real Future in Radio for Well Trained Men

Radio already gives jobs to more than 300,000 people. In 1935 over $300,000,000 worth of sets, tubes and parts were sold—an increase of 20% over 1934! Over 1,100,000 auto Radios were sold in 1935, 25% more than in 1934! 22,000,000 homes are today equipped with Radios, and every year millions of these sets go out of date and are replaced with newer models. Millions more need servicing, new tubes, repairs, etc. Broadcasting stations pay their employees (exclusive of artists) more than $23,000,000 a year! And Radio is a new industry, still growing fast! A few hundred $30, $50, $75-a-week jobs have grown to thousands in less than 20 years!

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

Practically every neighborhood needs a good spare time serviceman. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs that you can cash in on quickly! Throughout your training I send you plans that made good spare time money—$200 to $500 a year—for hundreds of fellows. My training is famous as "the Course that pays for itself."

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My Course is not all book training. I send you special Radio equipment and show you how to conduct experiments and build circuits which illustrate important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. This 50-50 method of training makes learning at home interesting, fascinating, practical.

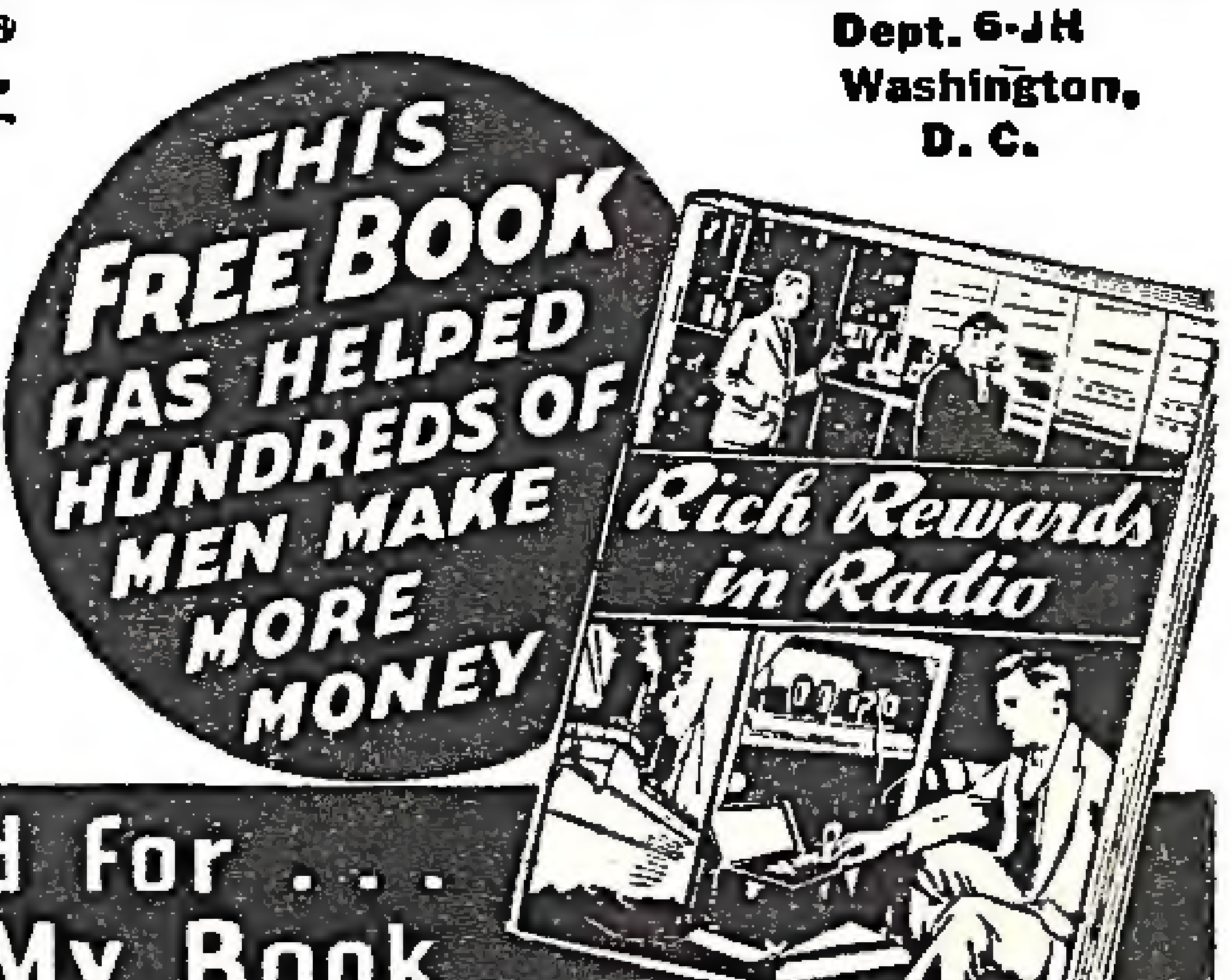
You Get a Money Back Agreement

I am so sure that I can train you successfully that I agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish. I'll send you a copy of this agreement with my Free Book.

Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It describes Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you actual letters from men I have trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste on a postcard—NOW!

J. E. SMITH, Pres., National Radio Institute
Dept. 6-JH
Washington, D. C.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National Radio Institute, Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

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IN CANADA

MODERN MECHANIX
HOBBIES & INVENTIONS

SEPTEMBER
1936

Volume XVI
Number 5

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NEXT MONTH

Daniel M. Daniel, New York World-Telegram baseball writer, contributes an unusual article on unusual phases of the game for the October issue. In something of the manner of the late Ring Lardner, Mr. Daniel recalls the first player to wear a glove, the first catcher to wear a mask and countless anecdotes of the national game. If you enjoyed his "Scoring on Stolen Signals" last month, you will like the October article. Don't miss it!

FOR WORKSHOP FANS

The How-to-Build section of MM for October will include a bicycle radio set, directions for battery making, plans for a basement pump, an article on color photography for the amateur, design for a novel refreshment cabinet, lathe projects and scores of helpful home improvement kinks.

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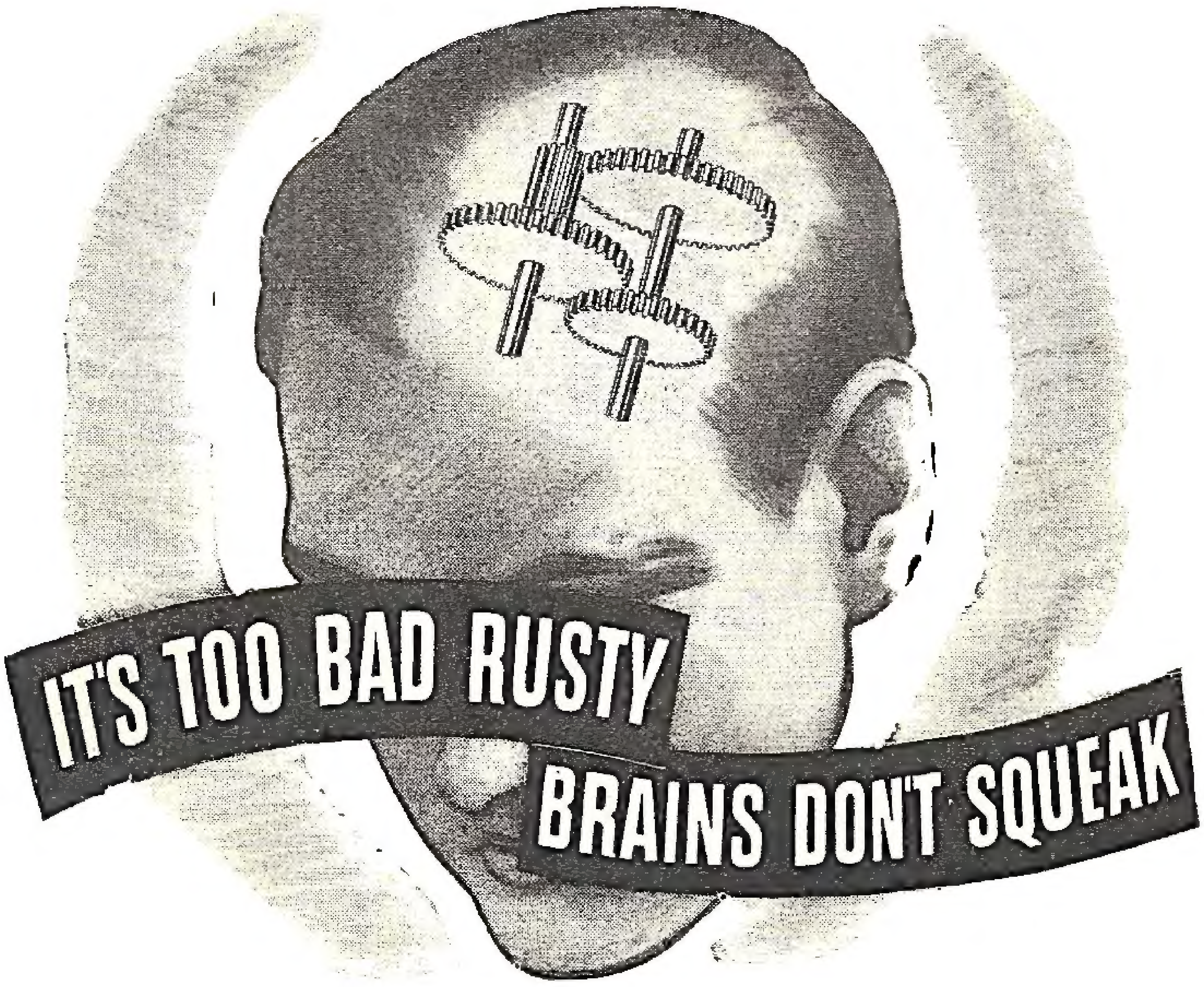

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INVENTORS

TO BE successful as an inventor, you don't need to be an Edison who took out 1099 Patents before he died, or a C. F. Kettering, who helped develop the Self-Starter, Duco, Ethyl Gas, and other outstanding inventions, and is today the famous head of the Research Division of the General Motors Corporation. In fact, you don't need to be known as an inventor at all, if you have a practical, useful, salable invention—or an idea for one—**and go about it right.**

Remember that for every Edison or Kettering, for every McCormick, DeForest or Atwater Kent—there have been thousands of unknown men whose inventions helped along the wheels of progress and helped the inventors financially at the same time.

Many Little Ideas Have Big Commercial Possibilities

For example, who knows the name of the inventor of the wooden golf tee, the ordinary crinkly hair pin, or the metal ball or disc that the average housewife uses for scouring pots and pans? Who knows the inventors of the thousands of gadgets that you will find in the ten-cent stores, in the modern drug and department stores? Some day, stop and look at some of the simple articles you'll find on the counters of a ten-cent store. Notice how many of them are marked Patented or Patent Applied For. It is an interesting, educational experiment. These inventors, most of them, weren't of the genius class. They simply got an idea for doing something in a better, easier, faster, or more economical way—AND THEN DID SOMETHING ABOUT IT.

Interesting Points

Who is today's "champion inventor"?

Ans.: John F. O'Connor, of Chicago, Ill., holds 949 Patents, more than any other living man.

Who is "Lady Edison"?

Ans.: Miss Beulah Louise Henry of New York City leads all women inventors, holds fifty patents; is known as "Lady Edison".

What is an improvement?

Ans.: Nearly all inventions today are improvements over earlier inventions. Often the improvement proves more profitable than the earlier invention.

Is a model necessary?

Ans.: Today, most inventions are patented without models. A subject fully explained in our book.

What is the preliminary search?

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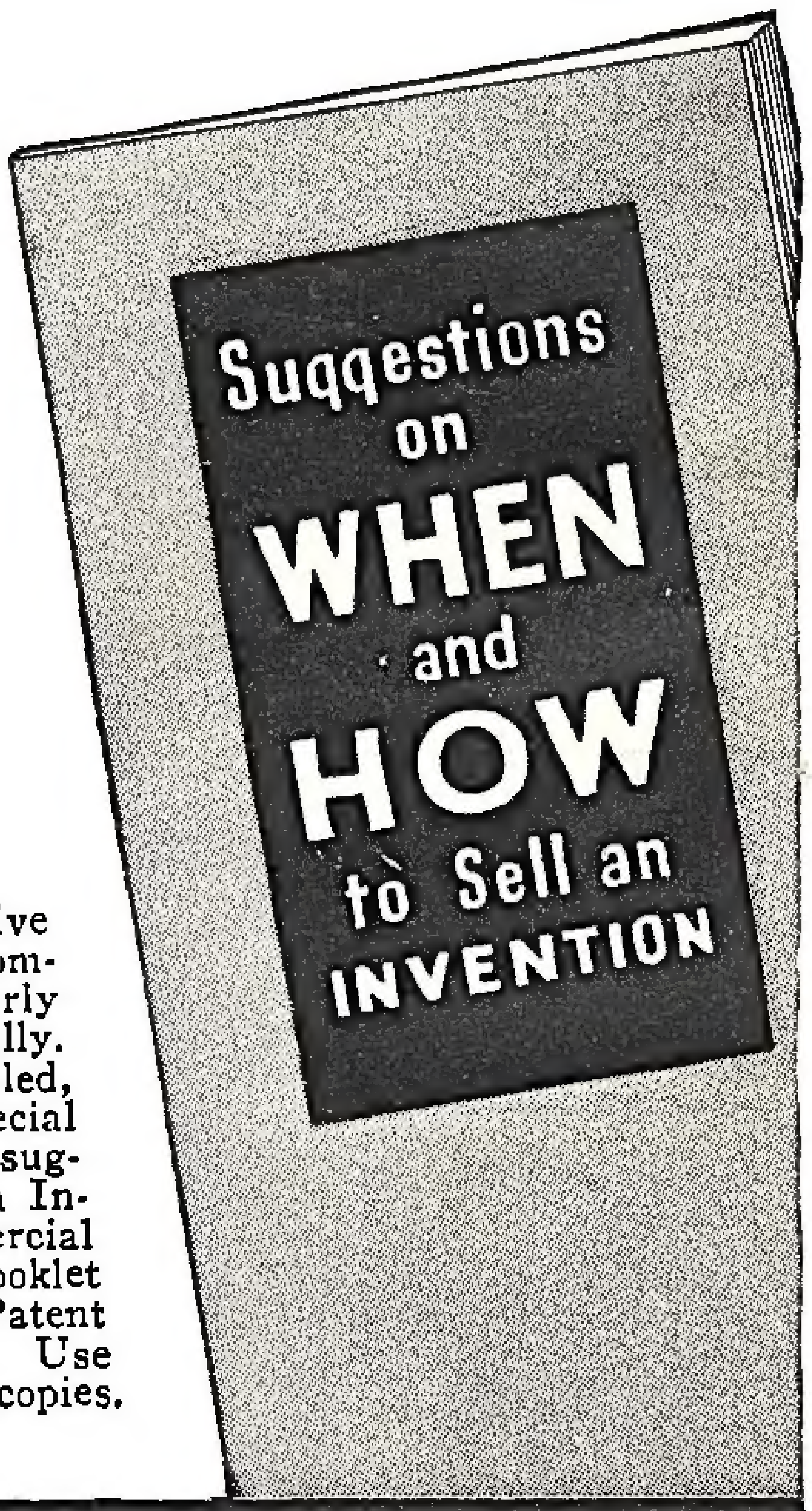

We Cordially Invite You to . .

NOTE ★ You may not be an Edison or a Kettering ★ but still you may have a good idea

YOUR QUESTIONS ANSWERED! There are a lot of questions that the average man with an invention, or an idea for one, wants answered before he goes ahead. Here are a few of them that most inventors put up to us: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the **first** man to think of my **invention**? Is a Patent worth the cost? Should I try to sell my invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been Patented? These are but a few of the questions which usually confront the average man. **You need the answers! YOU CAN HAVE THEM, without cost, trouble, or delay.**

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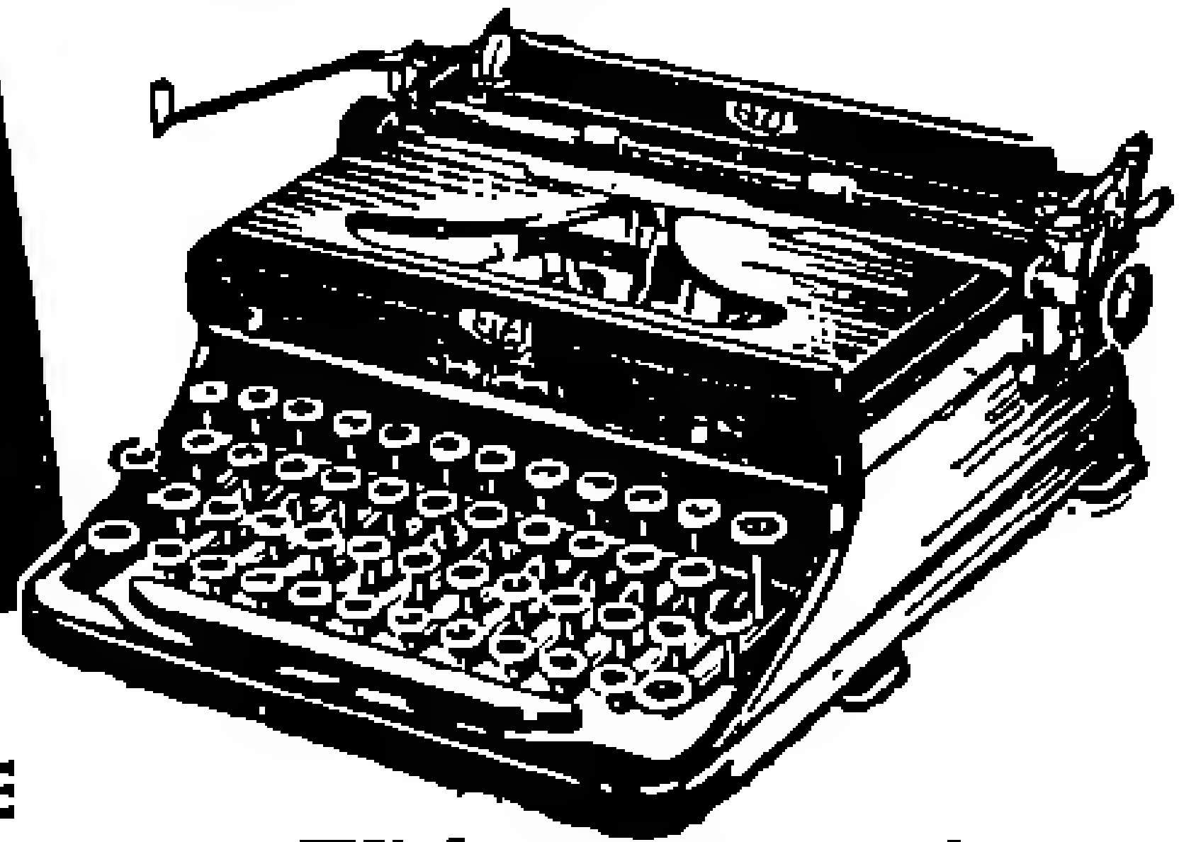

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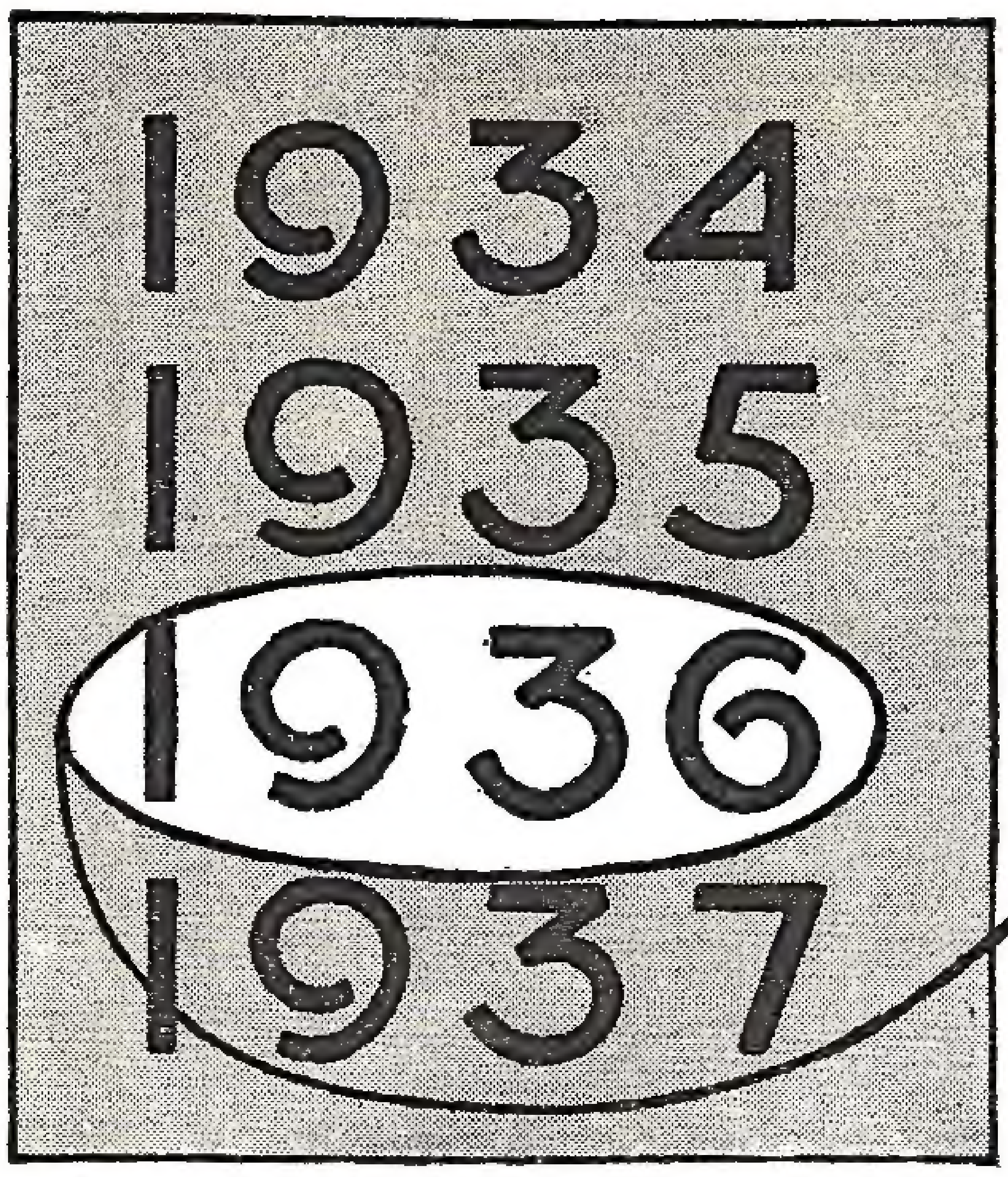

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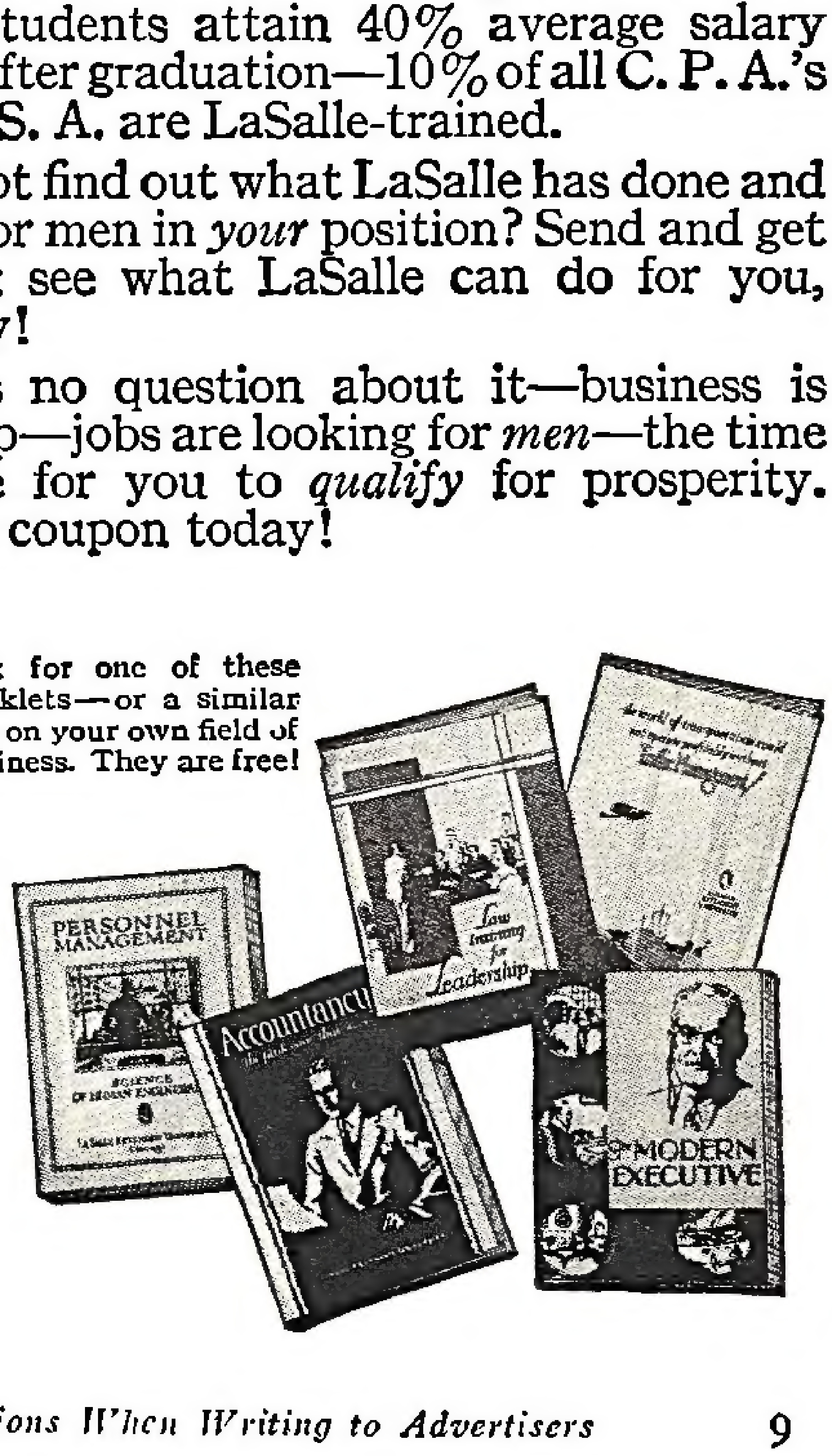

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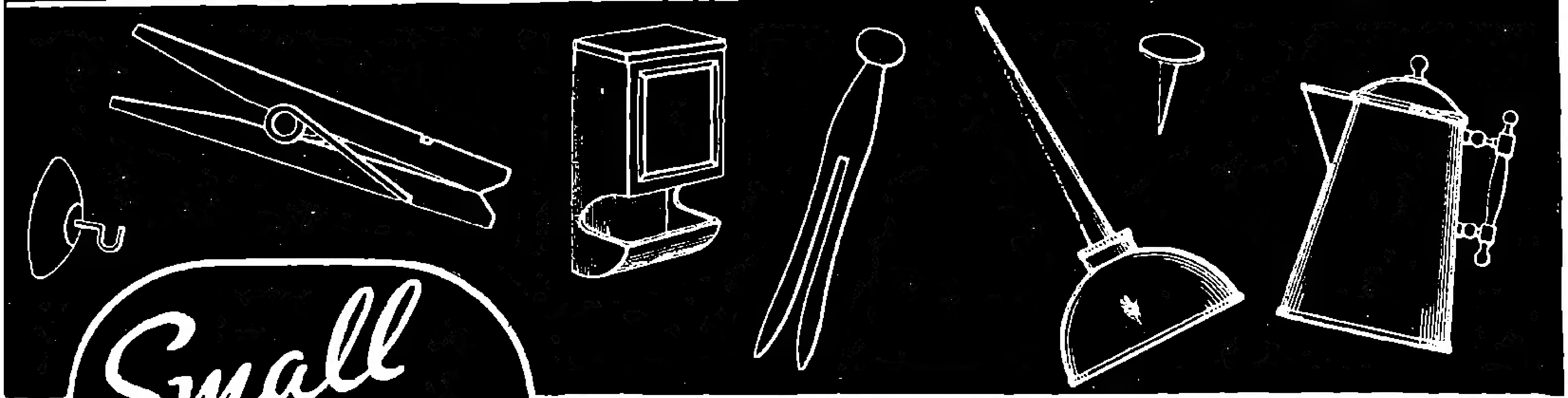

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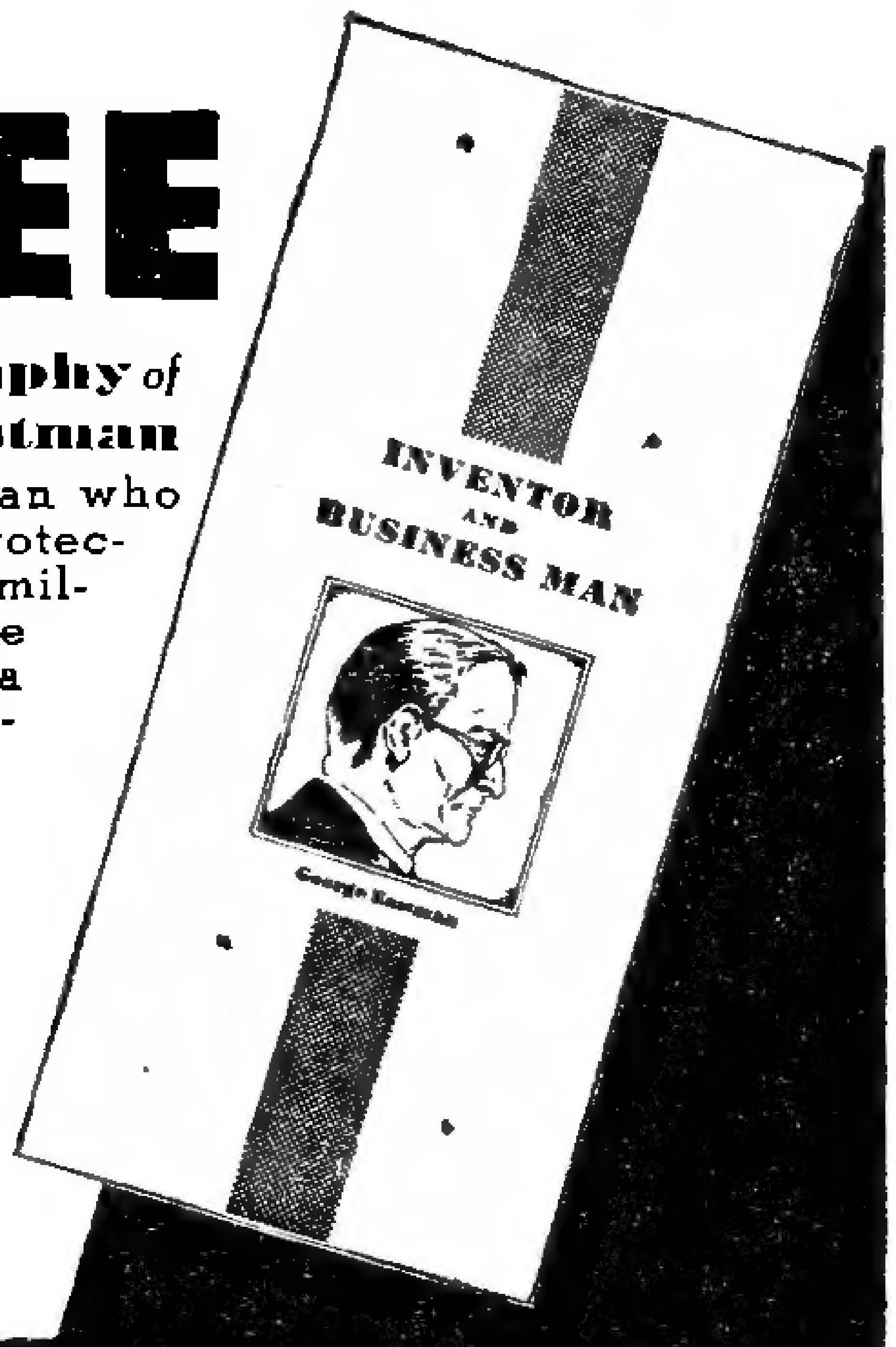

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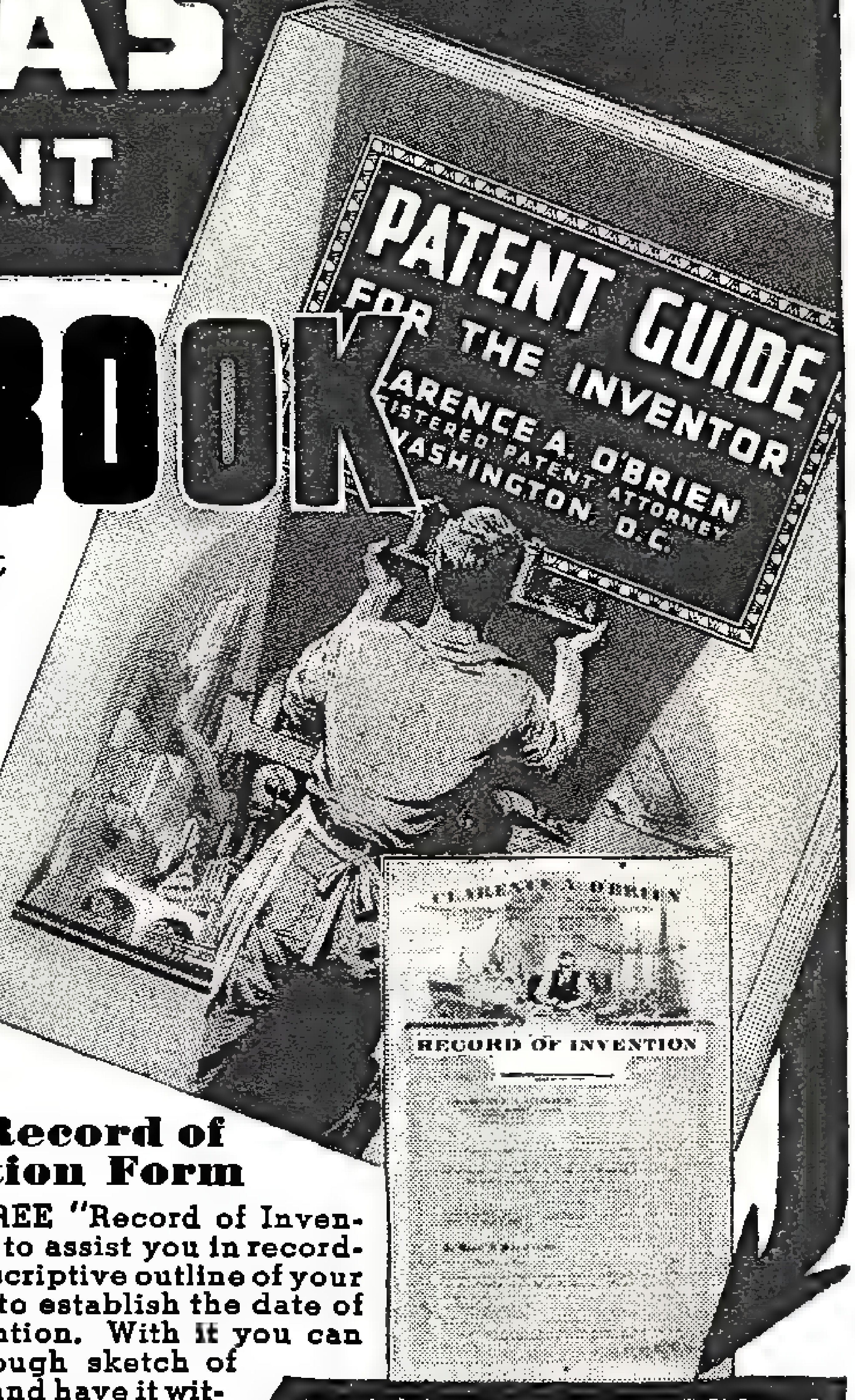

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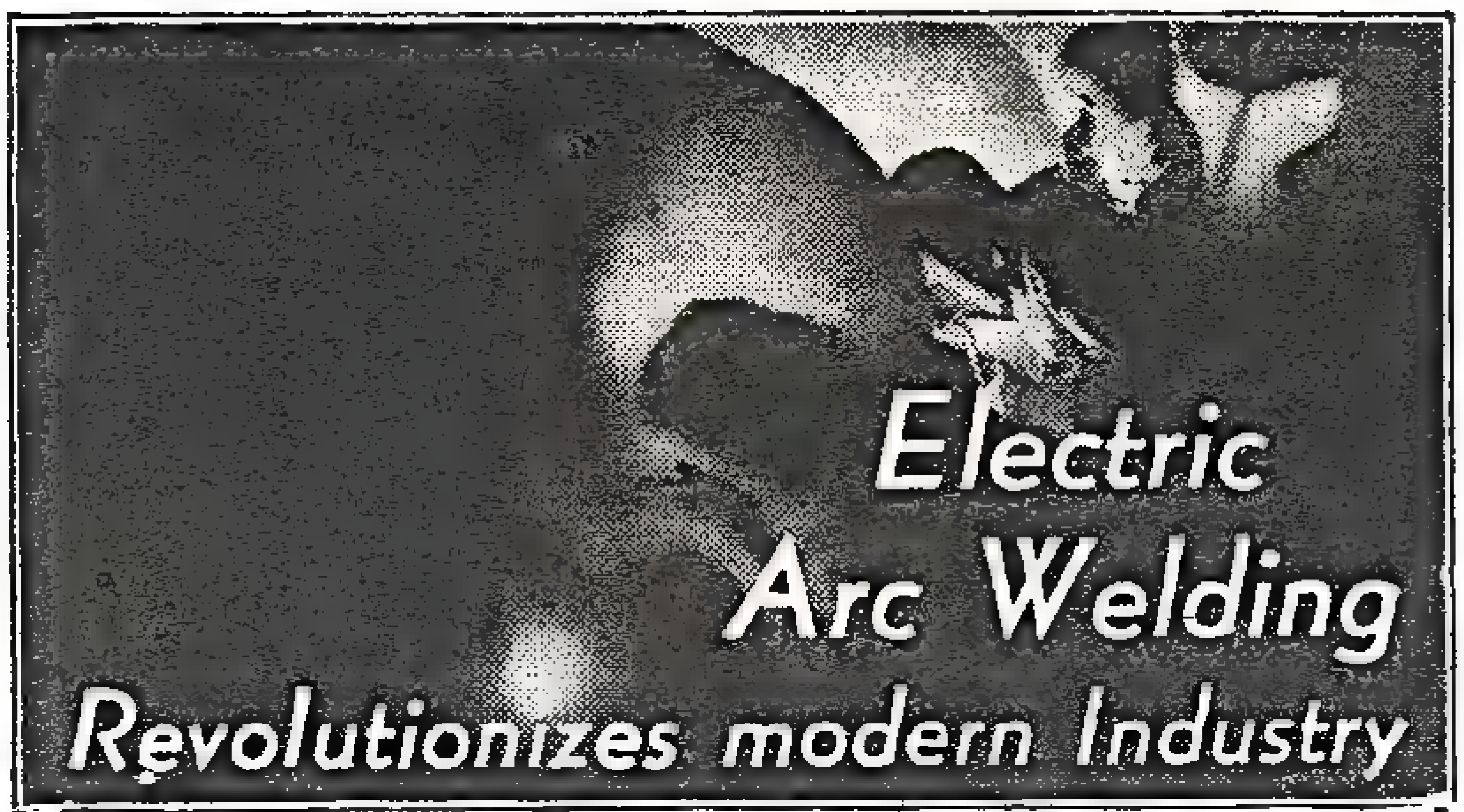

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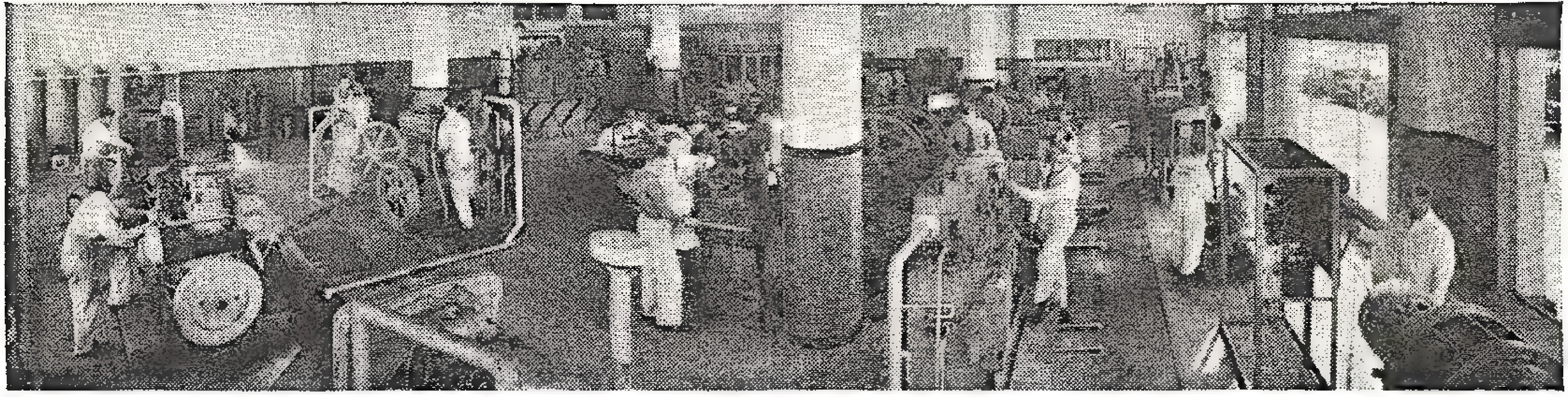
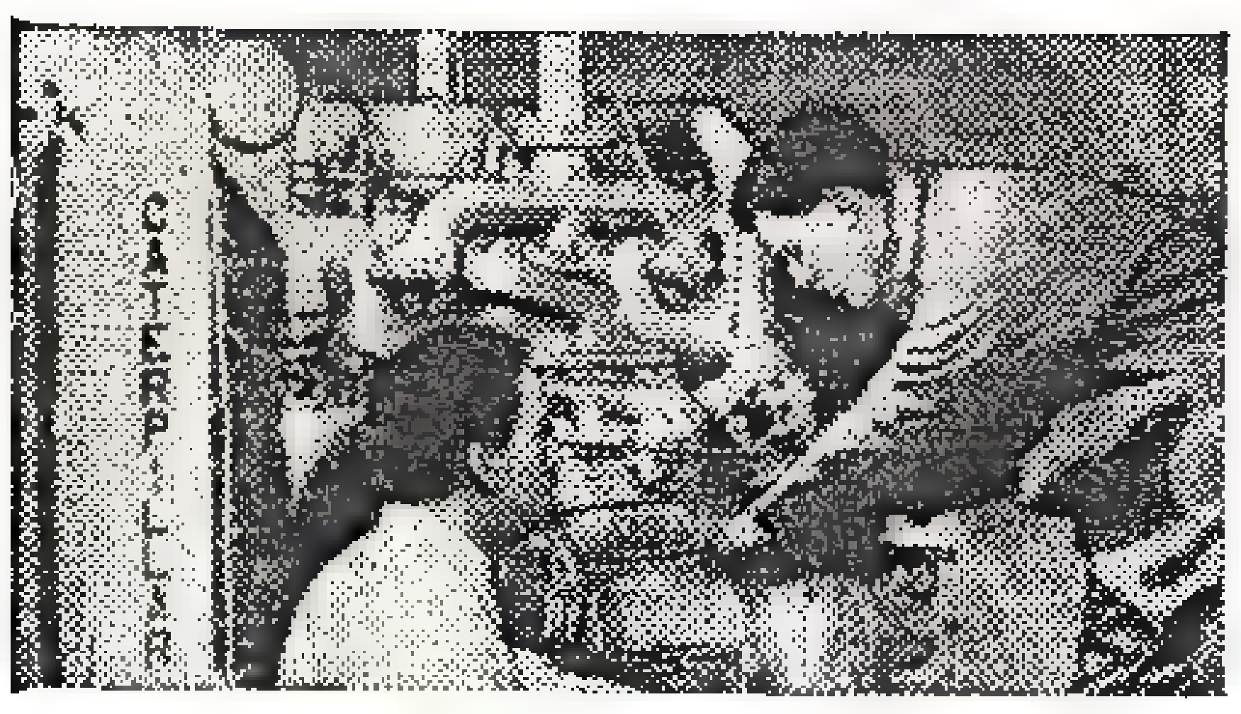
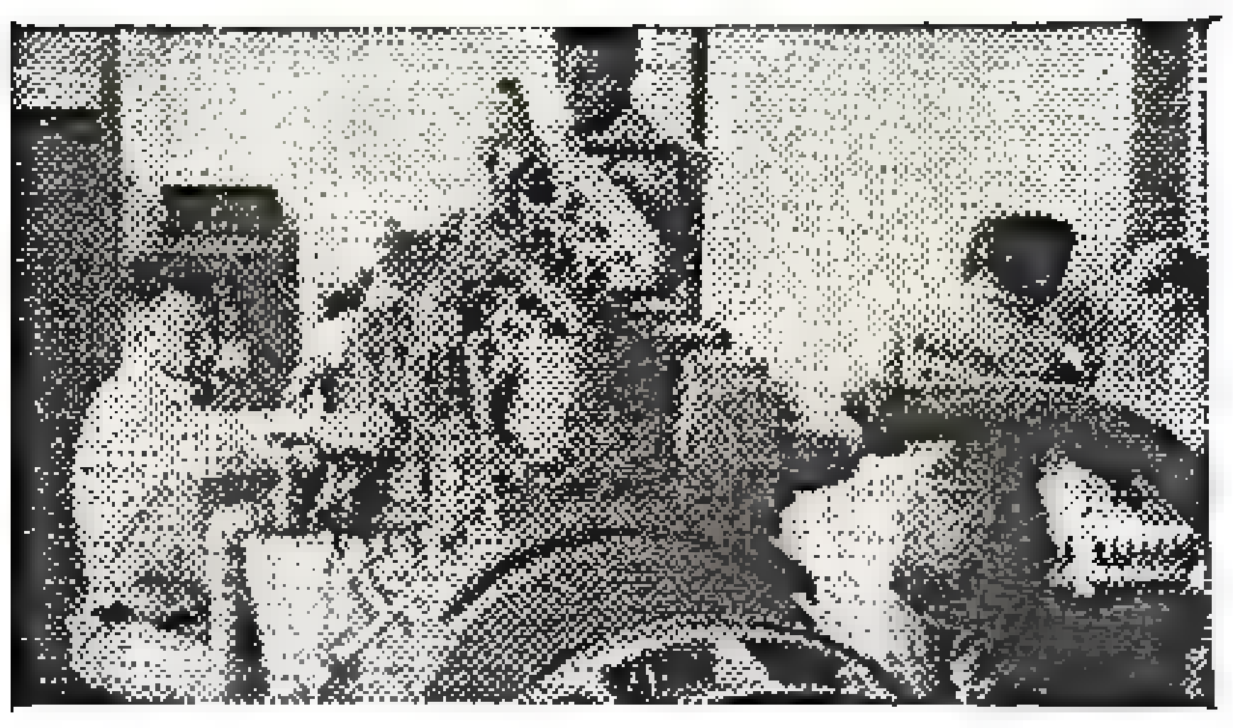
Learn DIESEL *and* GAS ENGINEERING



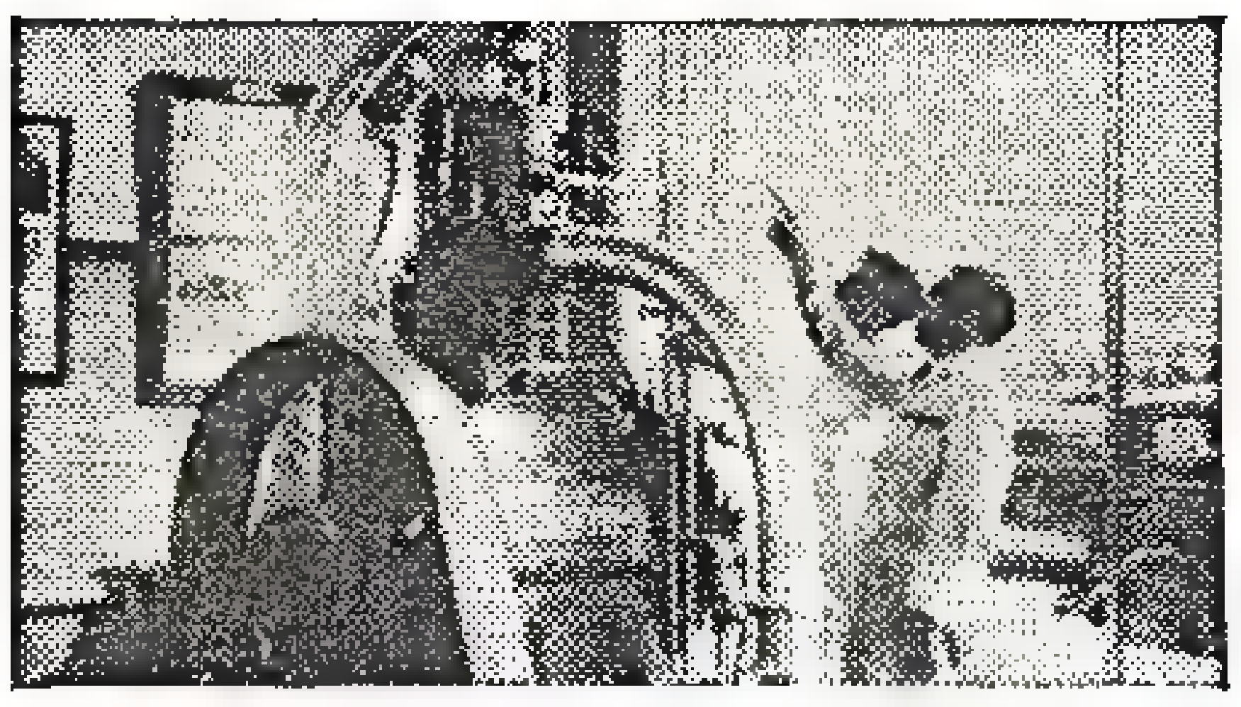
Partial view of Diesel-engine operating room—one of the important Departments at National Schools.



Students checking starting unit on Caterpillar Diesel.



Students servicing Fairbanks-Morse Diesel power generating unit.



Students making adjustment on Venn-Severin Diesel.

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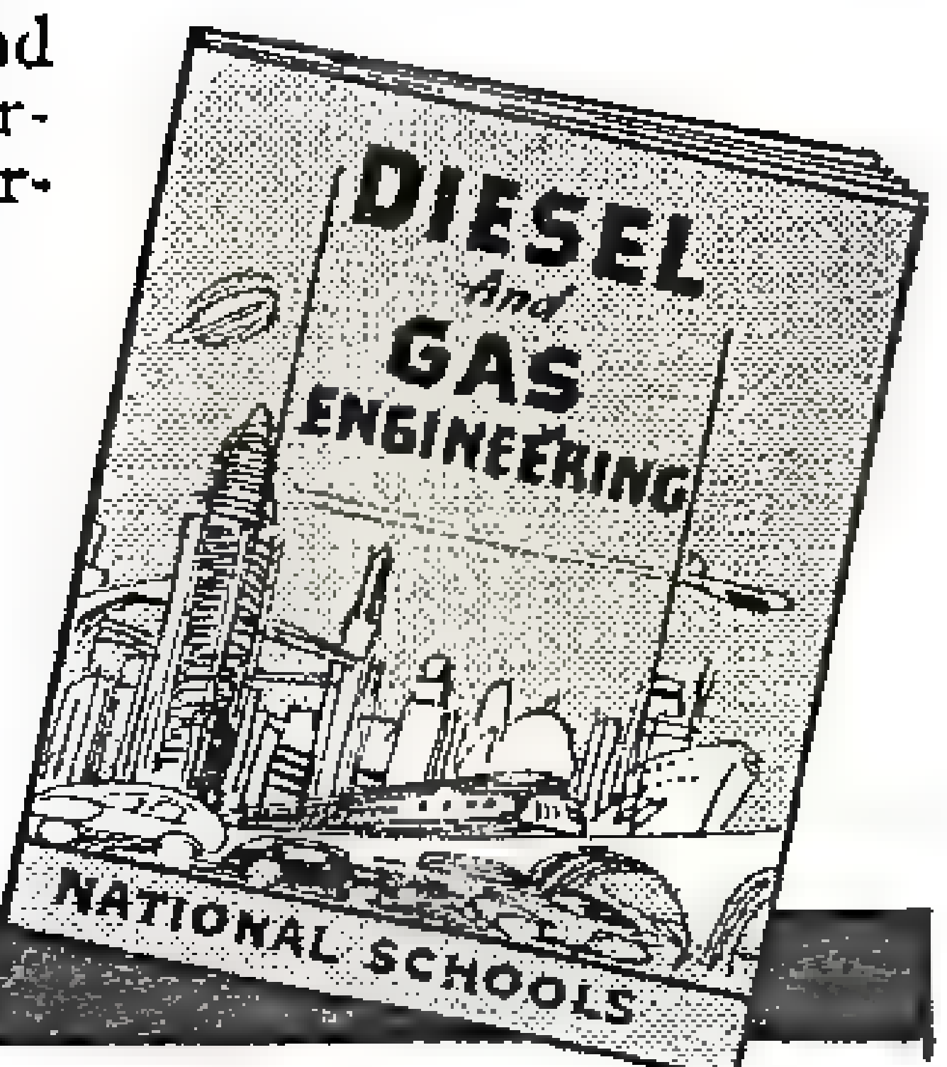

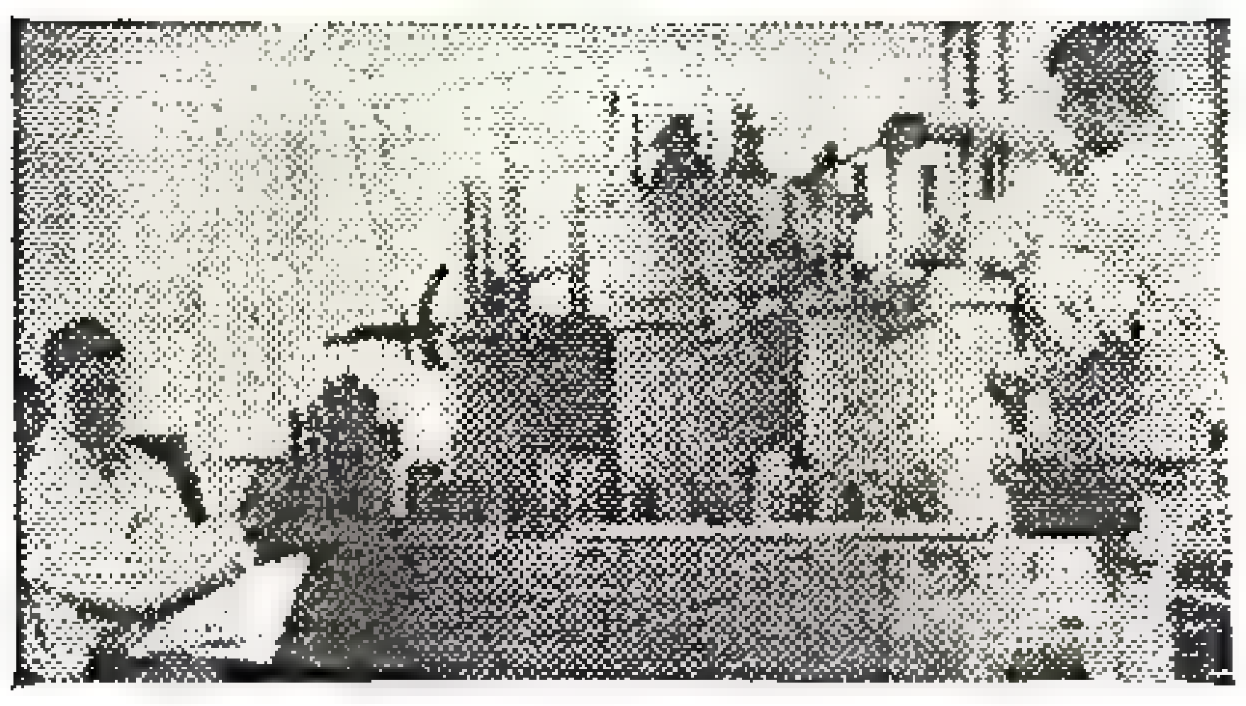

Students overhauling large heavy-duty Diesel.

Electrical trouble-shooting in gas engine department.

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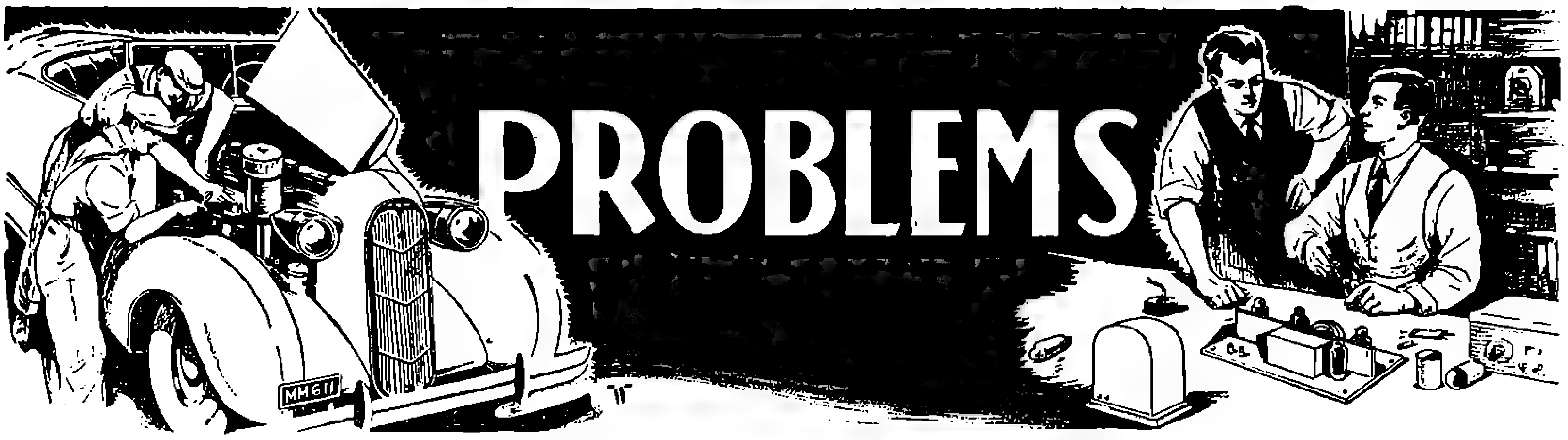


MM EDITORS ANSWER READERS' QUERIES

REMOVING PAINT FROM BOAT HULL

I intend to repaint my boat this fall before storing it for the winter. Since the paint on the hull has already showed signs of swelling I should like to remove the old paint before applying the new. Can you suggest a suitable paint remover?—J. T. B., Jacksonville, Fla.

A suitable paint and varnish solution can be made by dissolving 1 part caustic soda in 5 parts of water adding to this 1 part of mineral oil. The mixture is then boiled until the emulsion forms after which 1 part of fine sawdust is added to the solution to render it into paste form. The paste is then applied to the old painted surface and allowed to react. After the paint has loosened flush off the paste with clear water.

A SOLUTION THAT WILL FROST GLASS

I have heard of solutions for rendering transparent glass opaque, but don't know if this is possible. I should like to give several windows in my home a frosted finish so as to improve their appearance. If a formula of this kind is available you may rest assured I'd appreciate knowing about it.—S. L. N., Philadelphia, Pa.

Clear glass can be given a frosted appearance by applying the following mixture to its surface: 6 oz. magnesium sulphate, 20 oz. water and 2 oz. dextrin. Apply the solution with a soft cloth or brush and allow to dry. The magnesium sulphate will form itself into a frosted crystal effect as it dries.

ELIMINATING RADIO INTERFERENCE

Although our radio receiver is new and free from any defects we are bothered with static produced by telephone dial clicks and motor noises. Is there any method by which this nuisance can be eliminated or partly silenced?—P. O. N., Edenton, N. C.

Your local telephone company at your request will install a filter condenser on the telephone causing excessive interference in your neighborhood. There is no charge for this service. Electrical line disturbances can be eliminated in many instances with a choke and condenser filter. Although you can purchase a device of this type from any radio shop there is no reason why you can't make your own. Complete plans on radio noise elimination appear in the *Radio Builders Manual*, available from MM at 50c postpaid.

PARTS SOURCE FOR MIDGET AUTO

I plan to construct a midget auto as soon as finances permit and would like to know where the necessary parts can be secured. Must I use special parts in the construction work or can I fashion them from old auto and motorcycle materials?—R. G., Denver, Colo.

If you are planning on building a midget auto we advise you build "Midget Miller" which is described in full in the 1936 edition of our *How To Build It* book. This racing car, although tiny in size is authentic in constructional details and can be built from materials available at any auto graveyard. Either a lawn mower or washing machine gas engine may be used to power it or better still a good outboard motor.

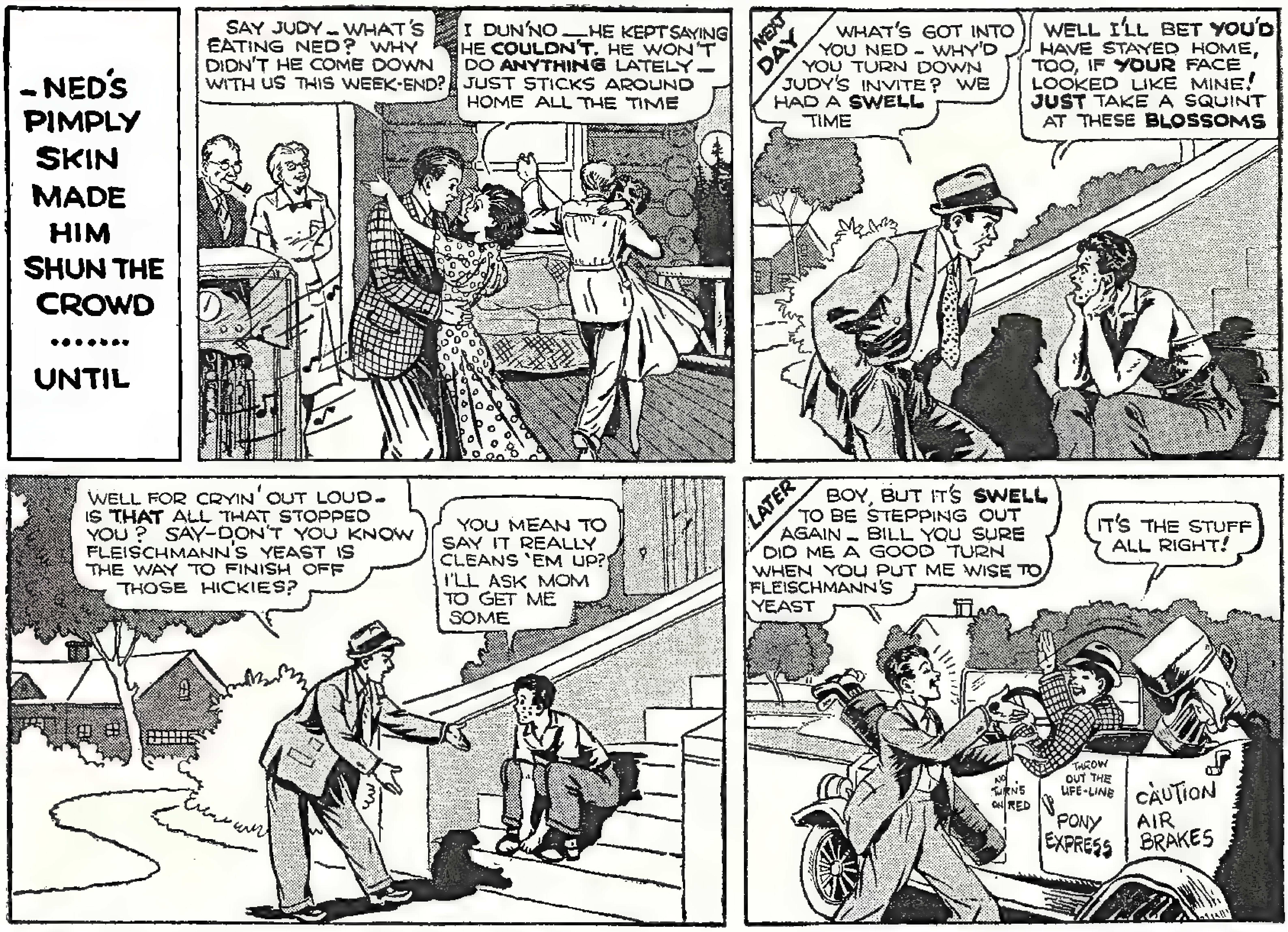
A ROAD BED FOR MODEL RAILWAYS

I am constructing a model railway of the "oo" gauge type and find difficulty in securing an authentic looking road bed. While roofing paper mounted over a wood foundation is satisfactory for "o" gauge use it doesn't look natural on the smaller gauge layout. Can you offer a suggestion for making a good imitation road bed on which the tracks can be attached?—S. D., Ft. Worth, Texas.

An authentic looking road bed for your model railway system is not at all hard to make. Secure as many feet of 3" by ½" white pine as your tracks are long then round off the edges with a block plane. Next cut strips of heavy cardboard for the imitation ties, the

[*Continued on page* 16]

AW, QUIT IT, CAN'T YOU—just tell the fellows I'm staying home


—NED'S PIMPLY SKIN MADE HIM SHUN THE CROWD .... UNTIL
SAY JUDY — WHAT'S EATING NED? WHY DIDN'T HE COME DOWN WITH US THIS WEEK-END?
I DUN'NO — HE KEPT SAYING HE COULDN'T. HE WON'T DO ANYTHING LATELY — JUST STICKS AROUND HOME ALL THE TIME
NEXT DAY
WHAT'S GOT INTO YOU NED — WHY'D YOU TURN DOWN JUDY'S INVITE? WE HAD A SWELL TIME
WELL I'LL BET YOU'D HAVE STAYED HOME, TOO, IF YOUR FACE LOOKED LIKE MINE! JUST TAKE A SQUINT AT THESE BLOSSOMS
WELL FOR CRYIN' OUT LOUD — IS THAT ALL THAT STOPPED YOU? SAY—DON'T YOU KNOW FLEISCHMANN'S YEAST IS THE WAY TO FINISH OFF THOSE HICKIES?
YOU MEAN TO SAY IT REALLY CLEANS 'EM UP? I'LL ASK MOM TO GET ME SOME
LATER
BOY, BUT IT'S SWELL TO BE STEPPING OUT AGAIN — BILL YOU SURE DID ME A GOOD TURN WHEN YOU PUT ME WISE TO FLEISCHMANN'S YEAST
IT'S THE STUFF ALL RIGHT!
NO TURNS ON RED
THROW OUT THE LIFE-LINE
PONY EXPRESS
CAUTION AIR BRAKES

HI THERE, JUDY — LOOK WHAT I'VE GOT IN TOW
WELCOME STRANGER — MY, IT'S NICE TO SEE YOU, NED —
YOU CAN BET'CHA LIFE I'M GLAD TO BE HERE, JUDY

Don't let adolescent pimples spoil YOUR chances for fun

PIMPLES can be joy-killers after the start of adolescence—from 13 to 25, or longer. At this time, important glands develop. Disturbances occur in the body. The skin gets oversensitive. Waste poisons in the blood irritate this sensitive skin. Pimples result.

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—clears the skin

by clearing skin irritants out of the blood

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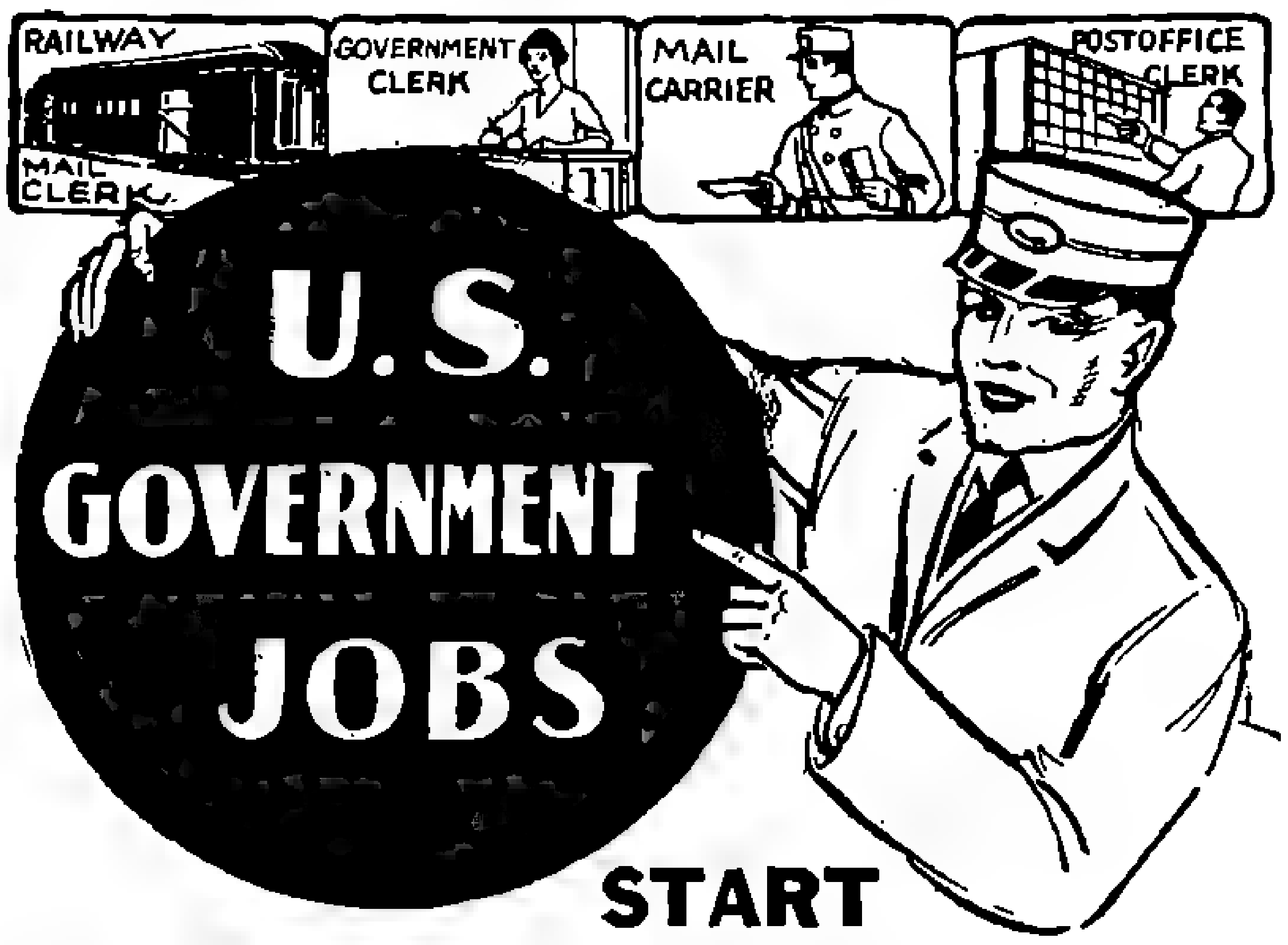

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Problems Editor Answers Queries

[*Continued from page* 14]

cardboard should be black if possible. Apply a coat of varnish to the white pine and after it has become tacky stick the ties in place. Last of all sprinkle ordinary cement over the assembly and your roadbed is complete. When dry the bronze rails may be attached.

STAINING LARGE FLOOR SURFACES

Our club recently acquired a medium size dance pavilion with unfinished floors. Can you tell us how to finish the floors as simply as possible so that we will be able to use the pavilion without making a large investment for paint?—Miss D. L., Chicago, Ill.

Probably the quickest and most inexpensive way to finish your dance floor would be to apply a stain made by dissolving a cup of permanganate potash crystals in a bucket of boiling water and applying this to the floor with a mop. If the shade is not deep enough apply a second coat then allow to dry. Over this apply a coat of sizing, then prepare your polish. This consists of ordinary bees wax dissolved in turpentine until a rich milky solution is obtained. Apply the polish with a mop and finish with a polisher until a luster is secured.

MAKING AN ELECTRIC REFRIGERATOR

Is it possible to convert my metal ice box into an electric type refrigerator? I have heard that it can be done but am doubtful about this.—G. F., Troy, Ohio.

Any ambitious mechanic can convert his ice box into an electric refrigerator. Plans on this conversion are available in blueprint form from MM at $1.50 per set.

MODEL PLANE SHORT CUTS WANTED

Having had very little experience in model plane building I'm puzzled as to how I can make authentic looking cabin windows. Is there any simple way of increasing the tensile strength of the balsa wood framework without adding too much weight to the plane? How can I make suitable wheels for models; that is wheels that will look much like the real ones?—J. S. P., Johnson City, Tenn.

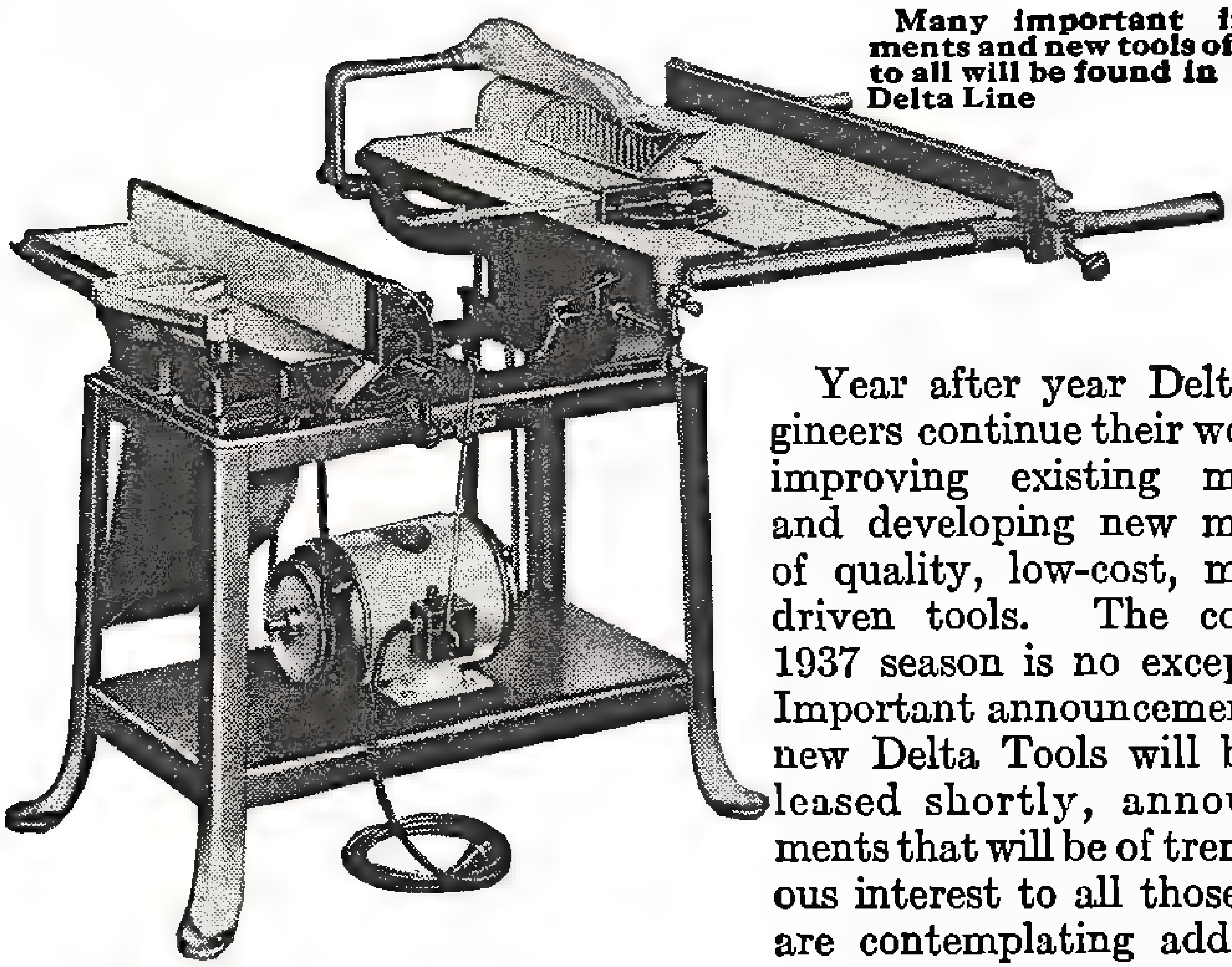
Light celluloid may be glued in place inside the fuselage for the window effect although Cellophane will be found much better for this purpose. The balsa wood frame can be strengthened by coating it with dope. Wheels can be turned from a block of balsa by inserting a bolt through the block and fastening in a hand drill. Use a razor held rigid for your cutting tool.

(Editor's Note: Your questions will be answered personally and free of charge by MM experts provided they do not require special research or involve trade secrets. Names and addresses of manufacturers of new products described in this issue can also be obtained free upon request. Enclose a self-addressed and stamped envelope for reply. Address: Problems Editor, Modern Mechanix Publishing Co., Greenwich, Conn.)

NEW DELTA TOOLS *will be out soon*

New 1937 Line to Be Announced Shortly

Many important improvements and new tools of interest to all will be found in the 1937 Delta Line



The New Delta 10-inch Circular Saw, shown in the illustration above in combination with the new Delta 6-inch Jointer, is the largest, heaviest and most completely equipped circular saw yet offered for the home work shop, tool shop, pattern shop, contractor and builder. It has numerous exclusive features that make it the season's outstanding tool.

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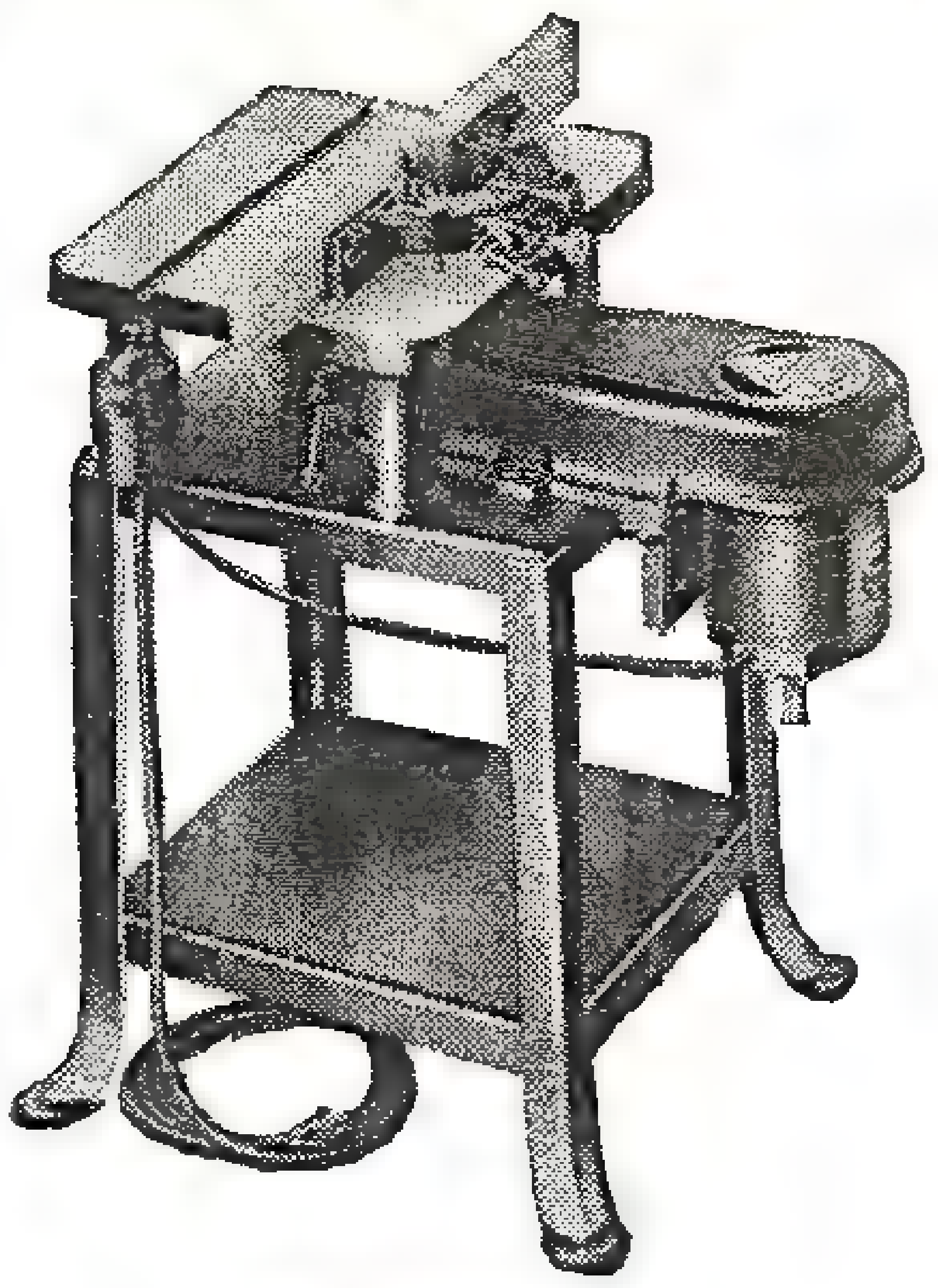

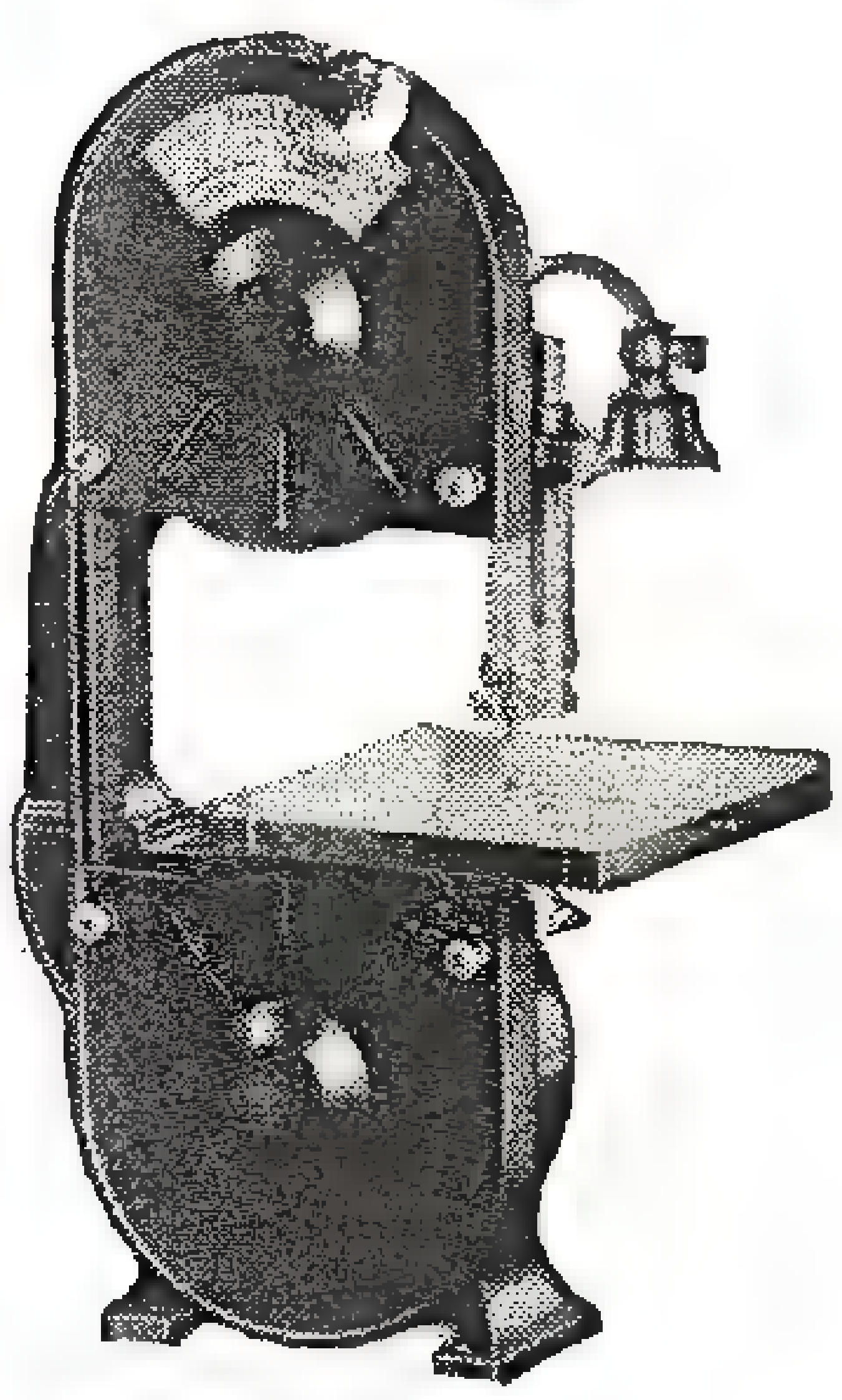

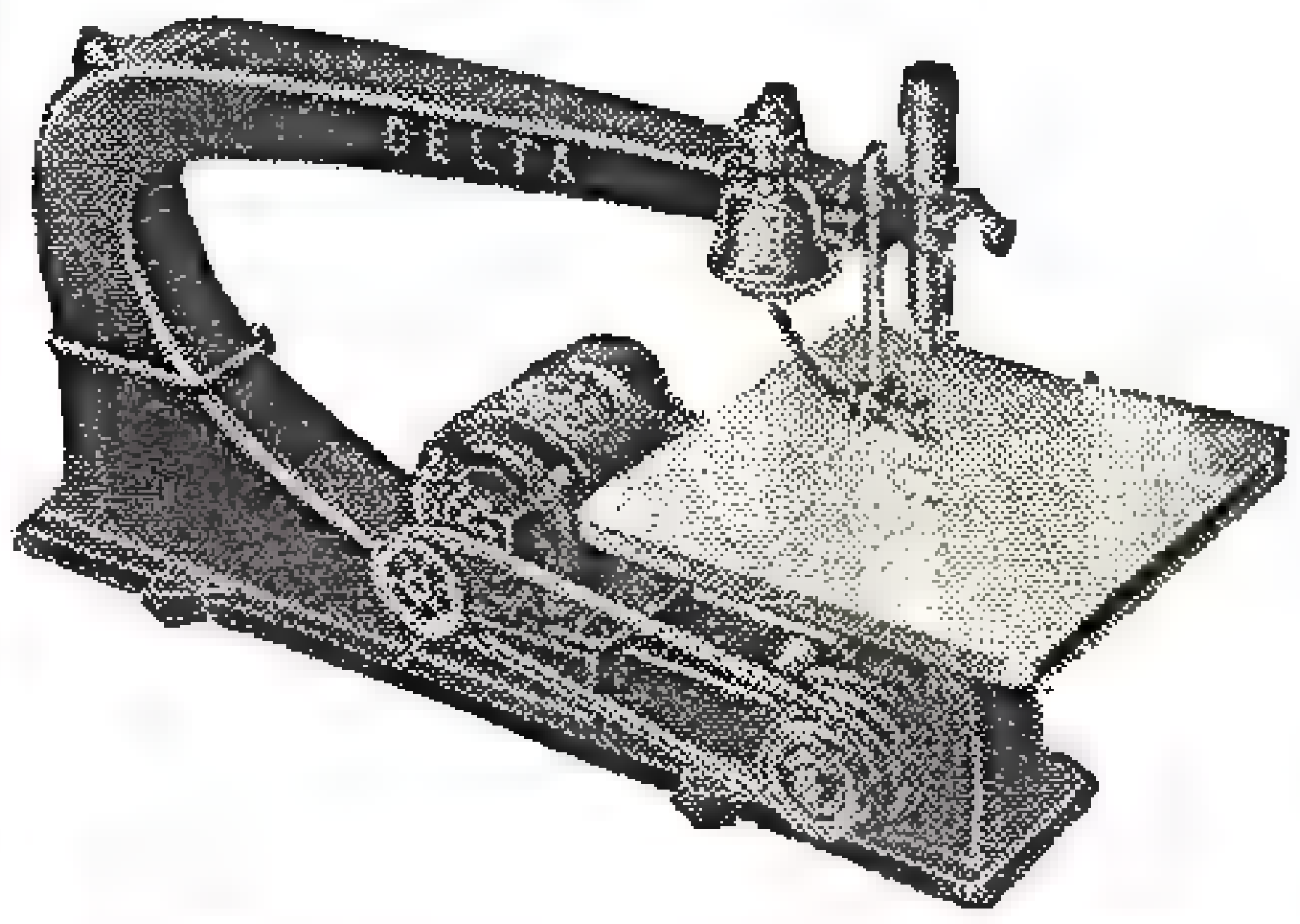

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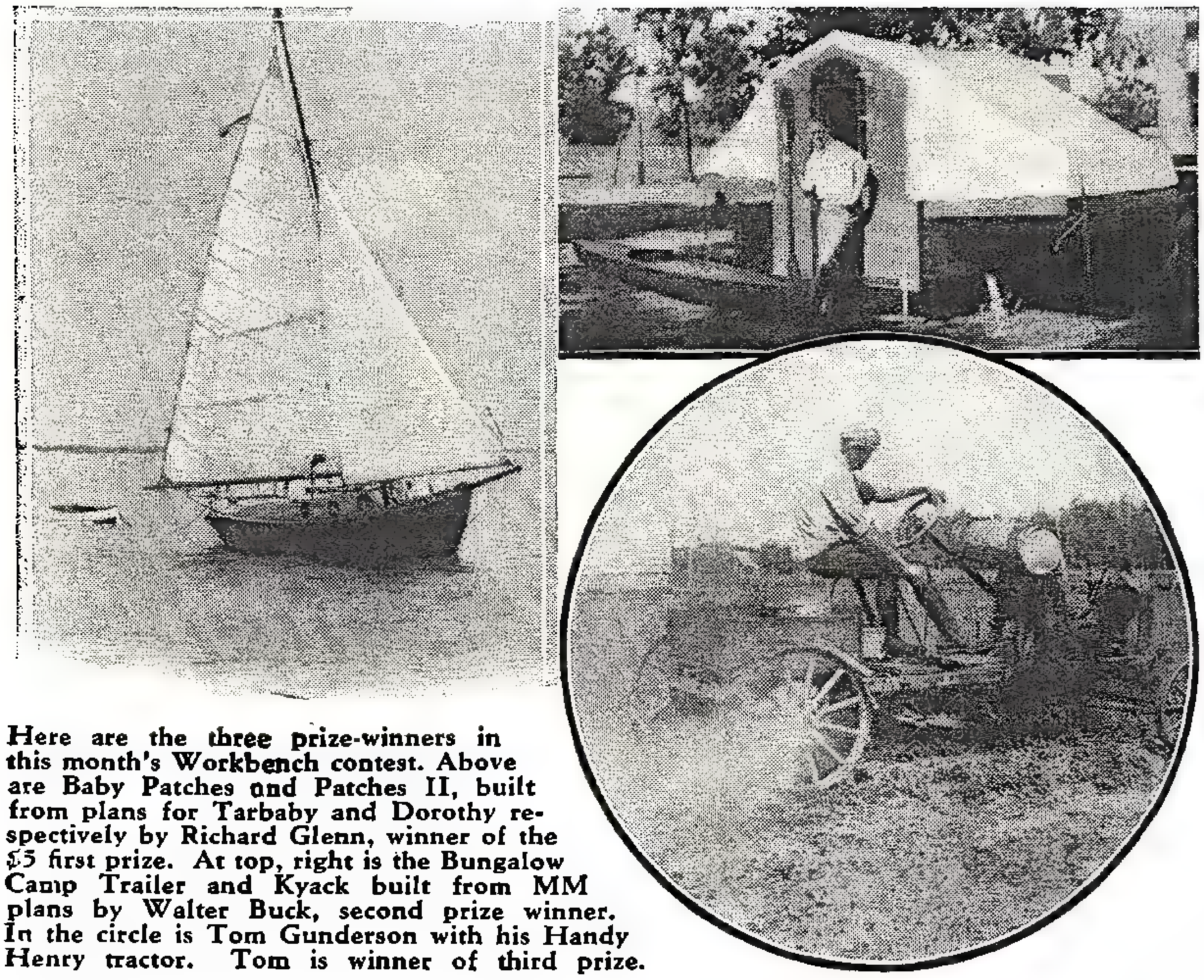


Here are the three prize-winners in this month's Workbench contest. Above are Baby Patches and Patches II, built from plans for Tarbaby and Dorothy respectively by Richard Glenn, winner of the $5 first prize. At top, right is the Bungalow Camp Trailer and Kyack built from MM plans by Walter Buck, second prize winner. In the circle is Tom Gunderson with his Handy Henry tractor. Tom is winner of third prize.

AS WAS predicted in the Workbench last month, this summer is finding more activity among MM readers than ever before. With the home workshop waiting, and good plans to work from, the hot summer days seem to be acting as an inspiration rather than a deterrent in getting projects completed. The letters from our readers being even more eloquent on this subject than we are, we shall start right out with one from Richard Glenn, winner of the first prize of $5 in this month's Workbench Contest.

Selfridge Field, Michigan.

Dear Editor:

May I enter two thoroughbreds? Enclosed find a snap of my Dorothy model sloop and Tarbaby model dingy, Patches II and Baby Patches respectively.

Patches II was built to scale other than being shortened 1½ inches between the frames as I wanted to stay below the three-ton gross law of the Philippine Government where I was stationed. She carried 320 square feet of canvas, the mast was 32 feet in length and rigged with one-fourth-inch galvanized wire. I used about 750 pounds of concrete for ballast inside.

I had a small 1½ horsepower Evinrude two-cycle outboard, about 15 years old, remodeled into an inboard and installed off center on the port side. It gave a speed of close to 5 miles an hour in still water, turning at about 180 R. P. M., which proved that Dorothy needs very little power to move her.

Of course I had to add sufficient keel for enough lateral surface to make her work to the windward very nicely, which she would do unless it got too rough. Owing to her narrow beam at the waterline of course she was rather tender, but with plenty of rudder surface she could be straightened up nicely as soon as she got under way.

As I will be stationed at Selfridge field now I have intentions of building a 27-foot skipjack schooner.

Richard Glenn, Sgt. A. C

Plans for both Dorothy and Tarbaby appeared in the first edition of How To Build 20 Boats, now out of stock, but they can still be obtained in blue print form. In the July issue the discovery of 200 copies of the first edition of How To Build 20 Boats was announced, and two weeks after it reached the stands, they were all gone. However, the plans are all available in blue print form, and are described in the big free blue print booklet. Send a self-addressed, stamped envelope if interested.

***

The second prize letter in this month's contest comes from Walter Buck, of San Luis Obispo, Calif. He writes:

San Luis Obispo, Cal.

Dear Editor:

Having been a subscriber to MM for several years, I feel that we have something in common. I want to say your magazine is one of the best on the market for everyone, and especially those fortunate people interested in various hobbies. Although I am a barber in the daytime, I am an ardent wood-worker at night.

I have constructed many projects from your magazine, the two largest of which I am enclosing pictures. They are a house trailer weighing 1,000 pounds, constructed at a cost of $70, and an Eskimo kyack constructed at a cost of $20.

In a recent issue I saw a trailer constructed from the same plans as mine (Bungalow Camp Trailer), but the total cost was given as $215. There being considerable difference in our costs, I thought you might be interested in our comparison.

Walter F. Buck.

the Editor's Workbench

For fast work, Tom Gunderson, of Red Lake Falls, Minn., comes forward to take third prize with his Handy Henry Tractor. Plans for this tractor were published in the July MM, and a month later found Tom with his tractor completed. These three prizes of $5, $3 and $2 respectively are awarded each month to readers sending in the best letters, accompanied by photographs, describing their work with MM projects. The contest is open to everyone. Remember in writing that the editors always want to know which articles you liked most and which you liked least in the current issues of MM. Tom's letter follows:

Red Lake Falls, Minn.

Dear Editor:

Enclosed are pictures of my Model T Ford Tractor. I am very well pleased with what I can do with her. I believe it will last longer than other outfits I have seen, and it cost me only $15.

I did not follow the plans exactly as I used an old Reo transmission in place of the Dodge specified. I did not raise up the rear end, but lowered the front end. I also left the tractor full length of Ford frame but plan to shorten it as well as the front axle. It sure has plenty of power. I put on a box behind to put in sand to give better traction.

Winners of Soapbox Derby Contest

The first prize of a Soapbox racer, complete with a full set of doenut tired wheels, goes to Billie Joe Neil, 309 E. 3d St., Bloomington, Ind. From the letters in the words "Hobbies and Inventions," Billie gathered 2661 words.

Arthur Santmier, 126 Smithfield Road, Woonsocket, R. I., is the winner of second prize, a "trike-wheeled" Soapbox racer. The third prize, a set of four doenut tired wheels, goes to H. B. Baker, Box 242, Morro Bay, Cal.

I like all your mechanical plans but I miss your airplane stuff. I like least the indoor projects.

Tom Gunderson.

***

The old adage that "many hands make light work" is aptly demonstrated by the ever-active Hi-N-Dri Yacht Club of Los Angeles, charter members of the Society of Modern Mechanix and Inventions.

Co-operation is the secret behind the success of their organization, and that they are successful is clearly shown by the following letter from David Forsyth, Commodore:

Los Angeles, Cal.

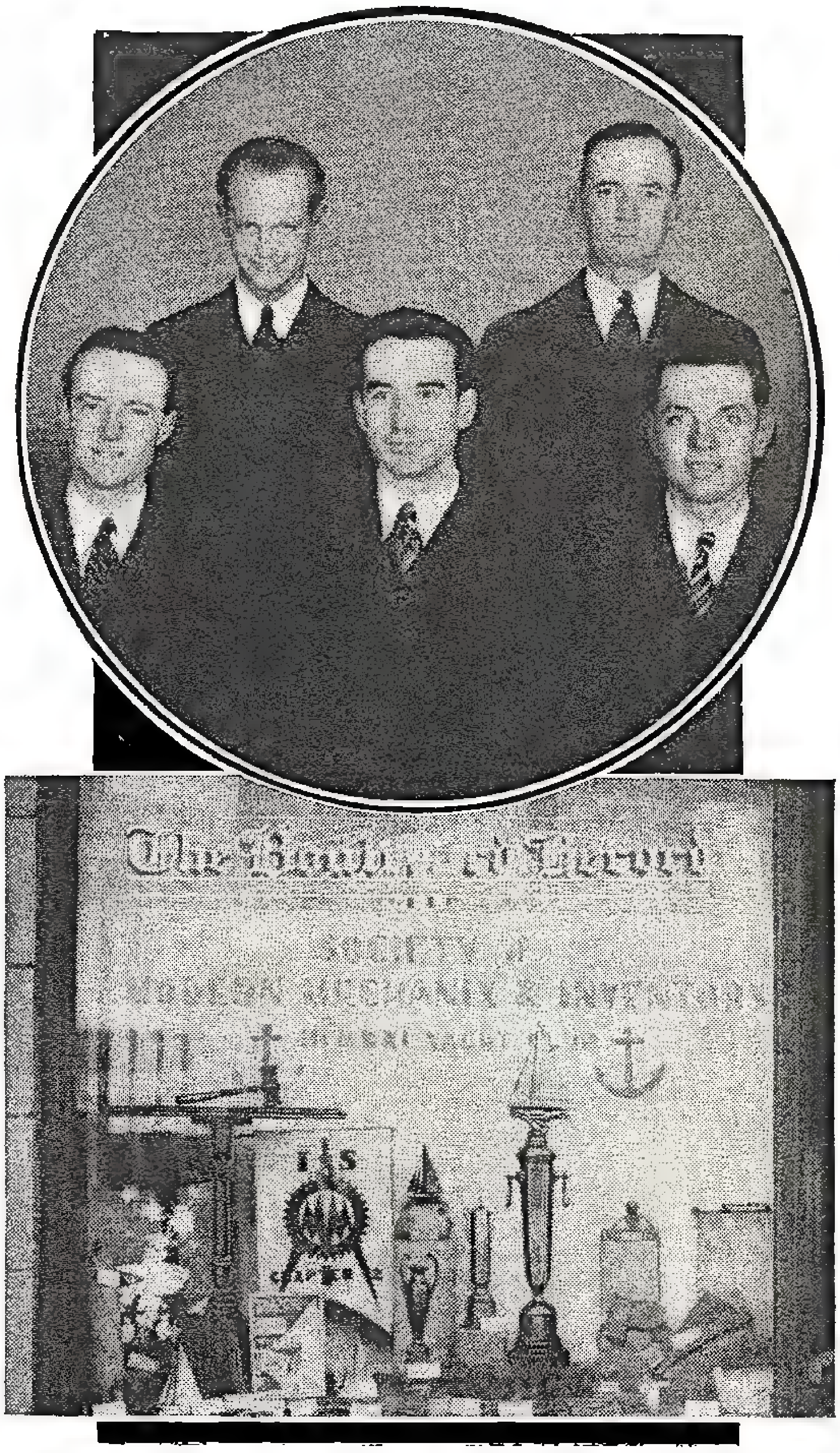
Dear Editor:

Greetings and salutations from Chapter 12, Society of Modern Mechanix and Inventors. We haven't heard much from the other chapters lately but these pictures will show that this chapter is still on its toes and going strong.

The display was placed in one of the windows of our local papers to show the people that besides racing and building boats our members do and make other things. It created a lot of curiosity and interest. The other chapters might use the same idea; publicity never hurts any organization.

This year's officers are: Alex Irving, Vice Commodore;

[*Continued on page* 20]



The Hi-N-Dri Yacht Club of Los Angeles recently staged this exhibit of their workmanship in the window of their local newspaper. Fleet officers for the next year will be left to right, standing, Fleet Captain Albert Holt, and Secretary Wayne Scott. Seated are Vice Commodore Alex Irving, Commodore David Forsythe, and Rear Commodore Robert Butte.

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Chips from the Editor's Workbench

[*Continued from page* 19]

Robert Butte, Rear Commodore; Albert Holt, Fleet Captain, and Wayne Scott, Secretary. I was re-elected Commodore. We are all working together to make this our biggest year, and from all indications, it will be.

The club is sending several boats to the Coronado Yacht Club races the latter part of this month to see if we can bring home some of their silverware. Our annual Small Boat race to Catalina was held July 4th. Our entries were smaller this year as most of the fellows are gradually getting larger boats.

By the way, according to our news agent we have sold more copies of How To Build 20 Boats than any other store in town with the exception of one down town store. Our drug store is about 4 miles out from the central shopping district.

David Forsyth, Commodore,
Hi-N-Dri Yacht Club.

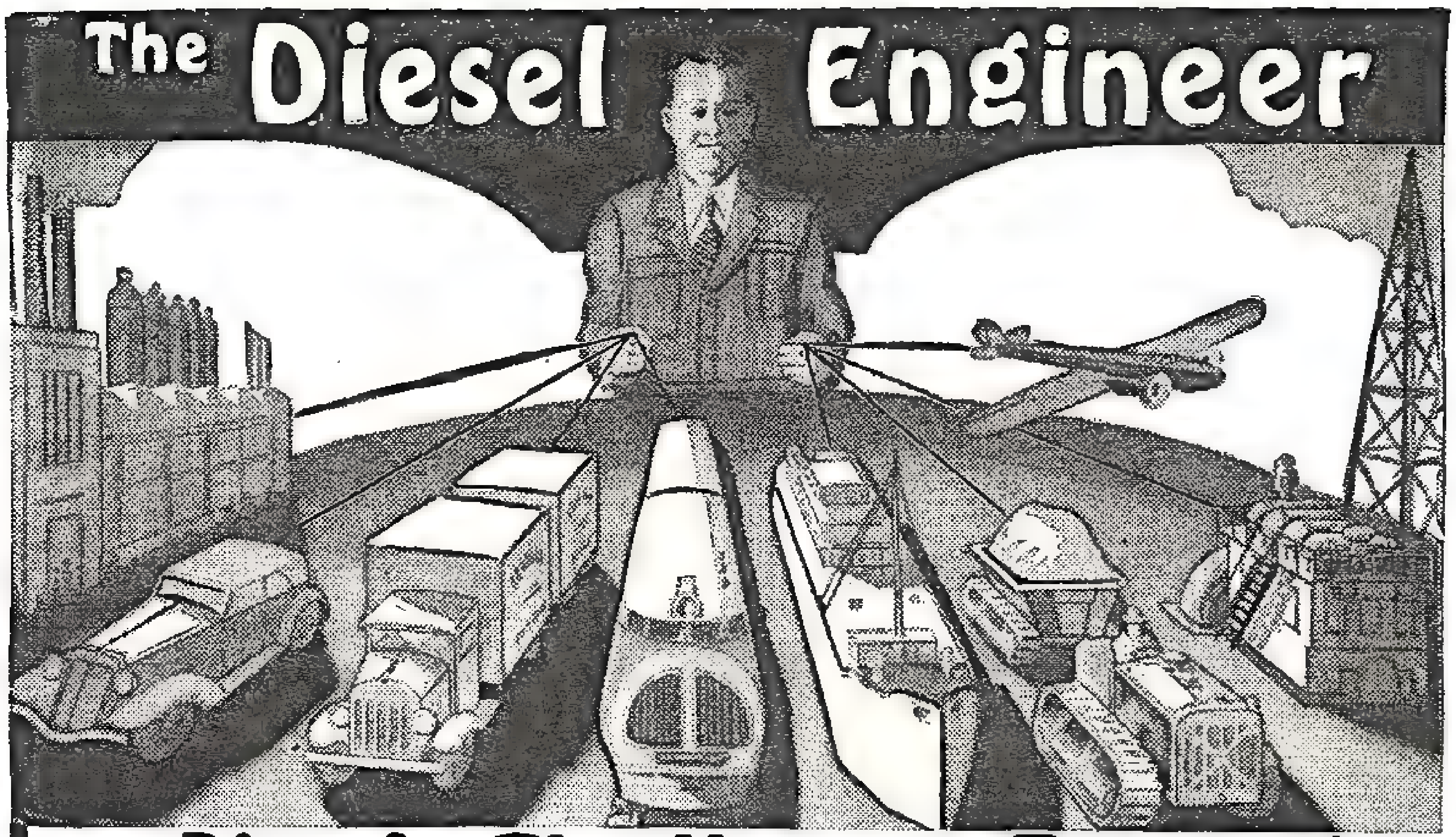
The Centinela Valley Model Railroad is the name of this "tin-plate" line operated by Leo Ridgman. It includes 166 feet of track, 18 locomotives, 58 cars, wrecking car and crane.

***

Another California group which is finding cooperation stimulates activity is the Centinela Valley Model Railroad of Hawthorne, Calif. This unique organization, which meets to compare notes, plan new railroads and swap "rolling stock" consists of 19 members, all devotees of "Tinplate" railroading. In addition the organization is the parent of Model Railroaders Digest, a miniature magazine devoted to "tinplate" railroading. Lee P. Ridgman is editor and publisher of the magazine, which is already going out to tinplaters in all parts of the country. As secretary and editor Mr. Ridgman welcomes inquiries.

California is not the only state enjoying club activity. The Five Star MM Club of Haverhill, Mass., has just added Robert Dube, Paul B. Magee and Max Wolf to its membership rolls during the past month. Reginald Dawkins is president, and has planned a full-sized program for the coming months. Clubs or groups desiring to become affiliated with the International Society of Modern Mechanix and Inventors and partake of its advantages should drop a line to the Society's headquarters, at 22 West Putnam St., Greenwich, Conn. Everything is free.

[*Continued on page* 23]



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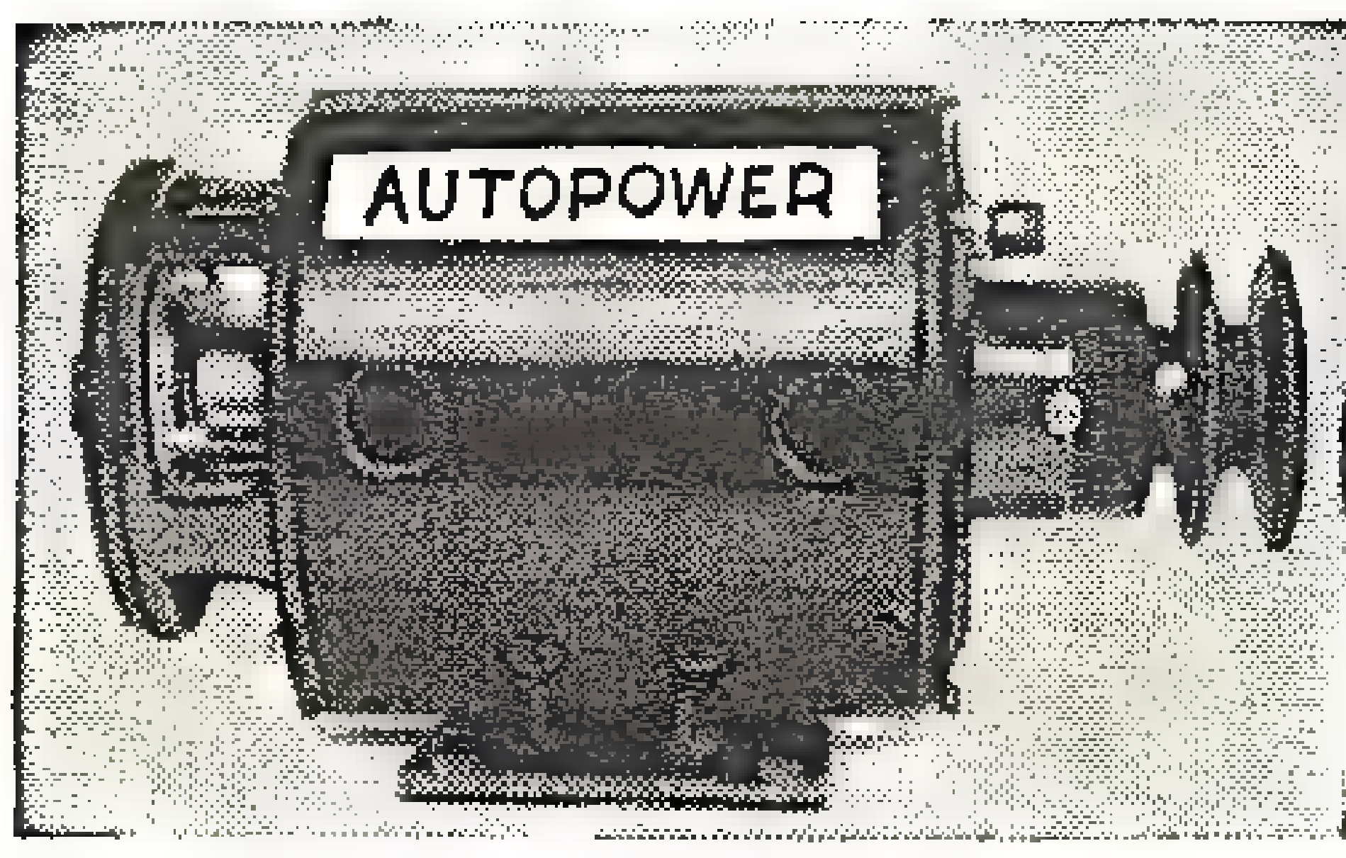

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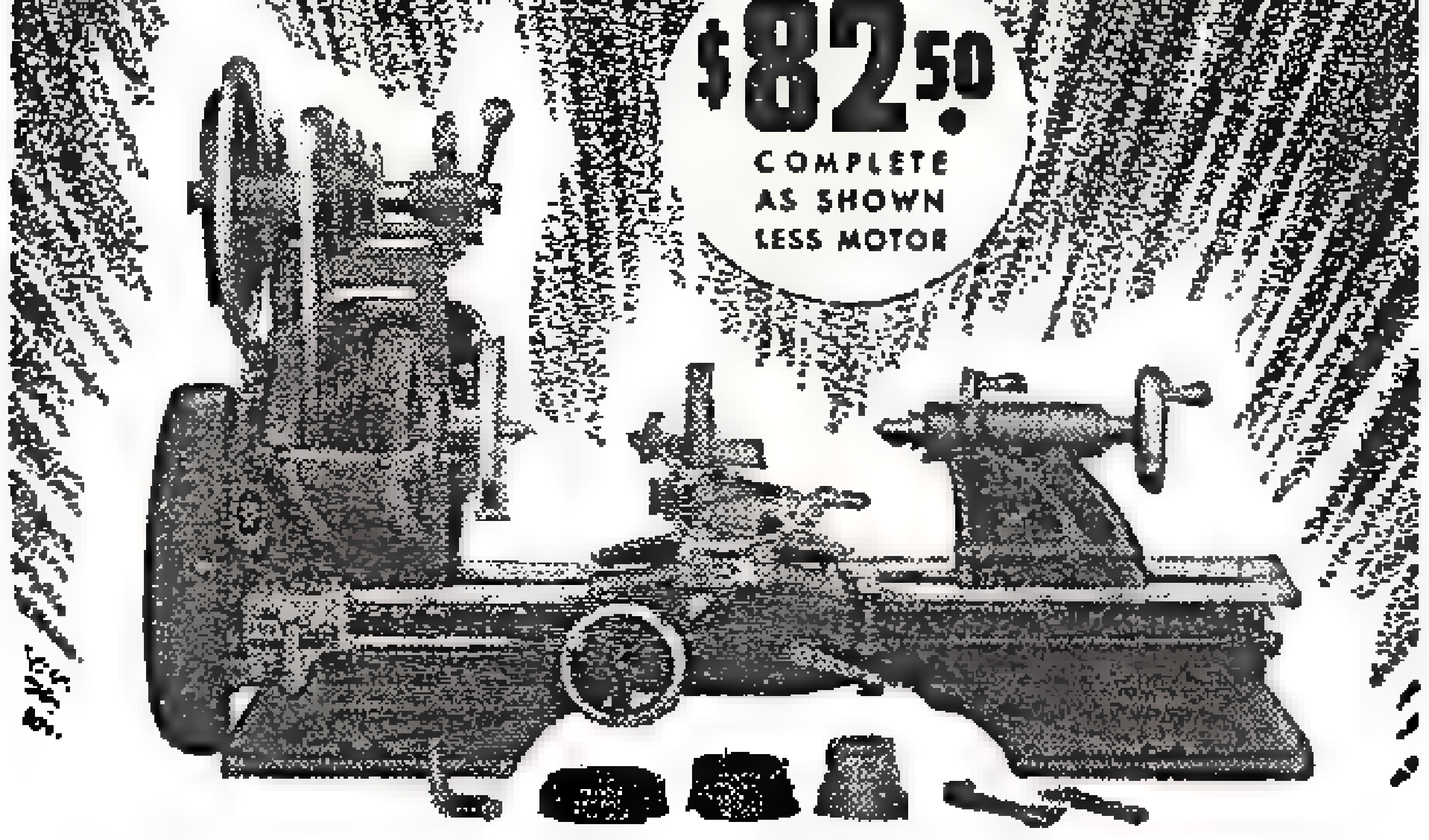
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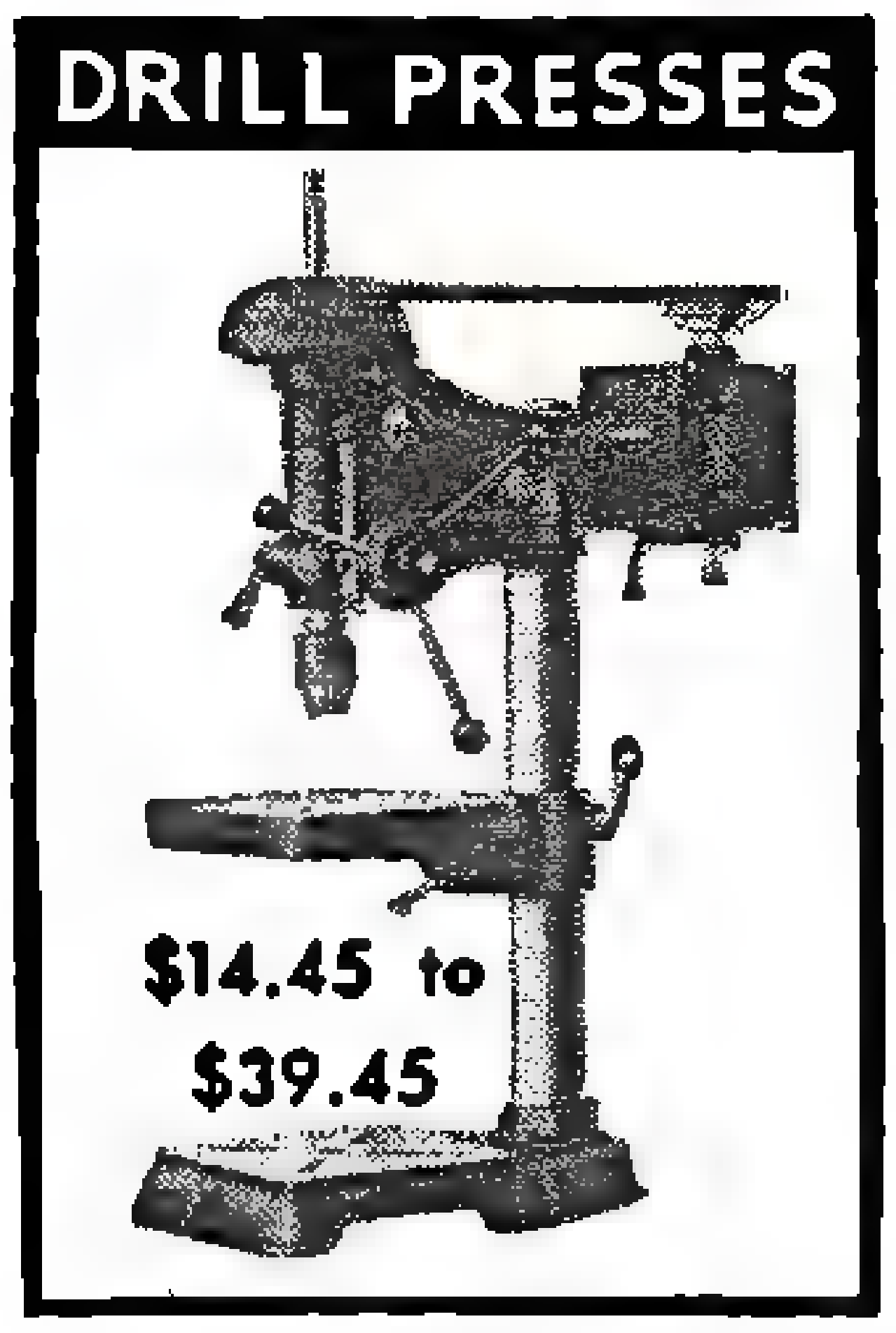

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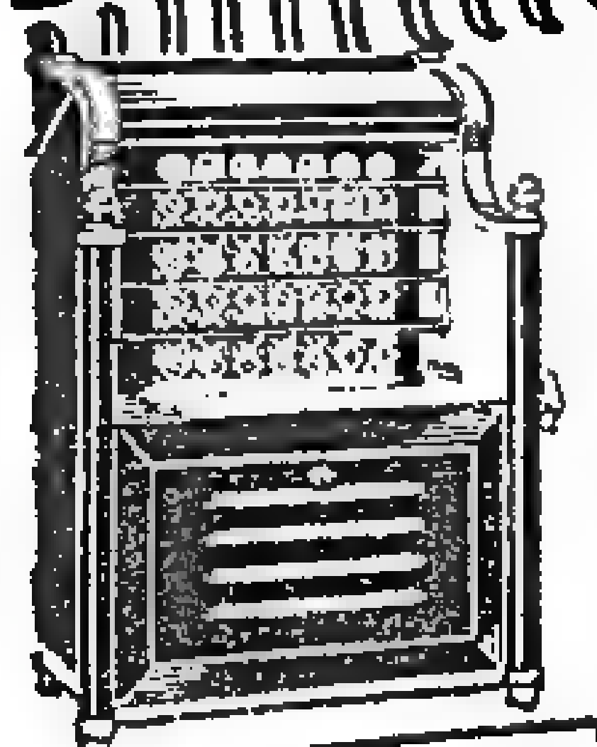

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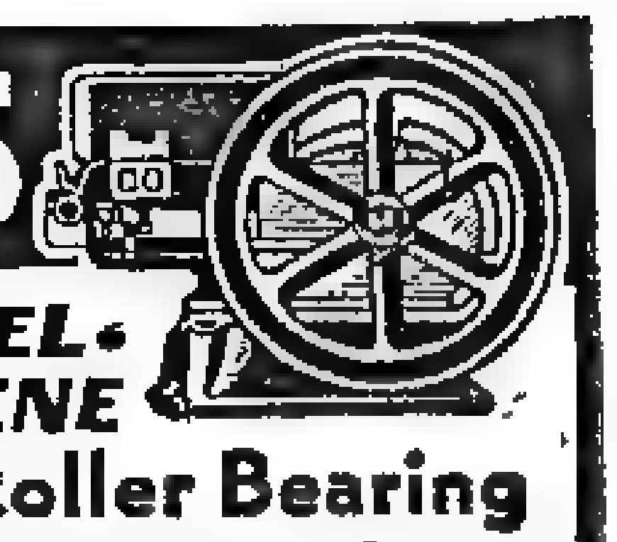

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Chips from the Editor's Workbench

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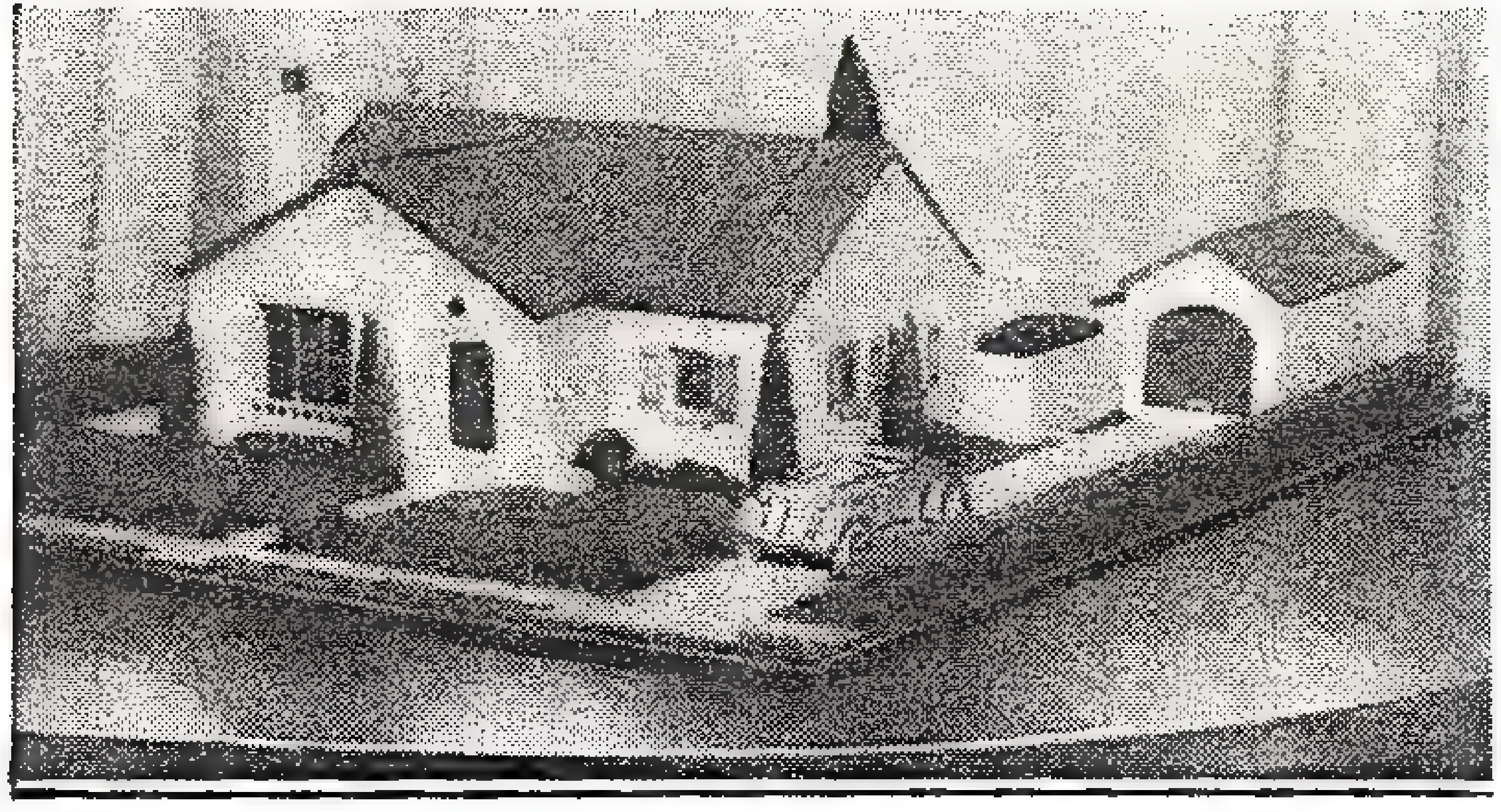


Using MM-plans for a full sized Spanish bungalow, Everett Saggus built this model to see if it looked as good as the plans. Balsa wood and corrugated paper furnished materials.

One way of determining what your future home is to look like is to see it in model form first. Everett W. Saggus of Warrenton, Ga., working from MM plans for a Spanish type bungalow, built a scale model of it first and found it to be just what he wanted.

***

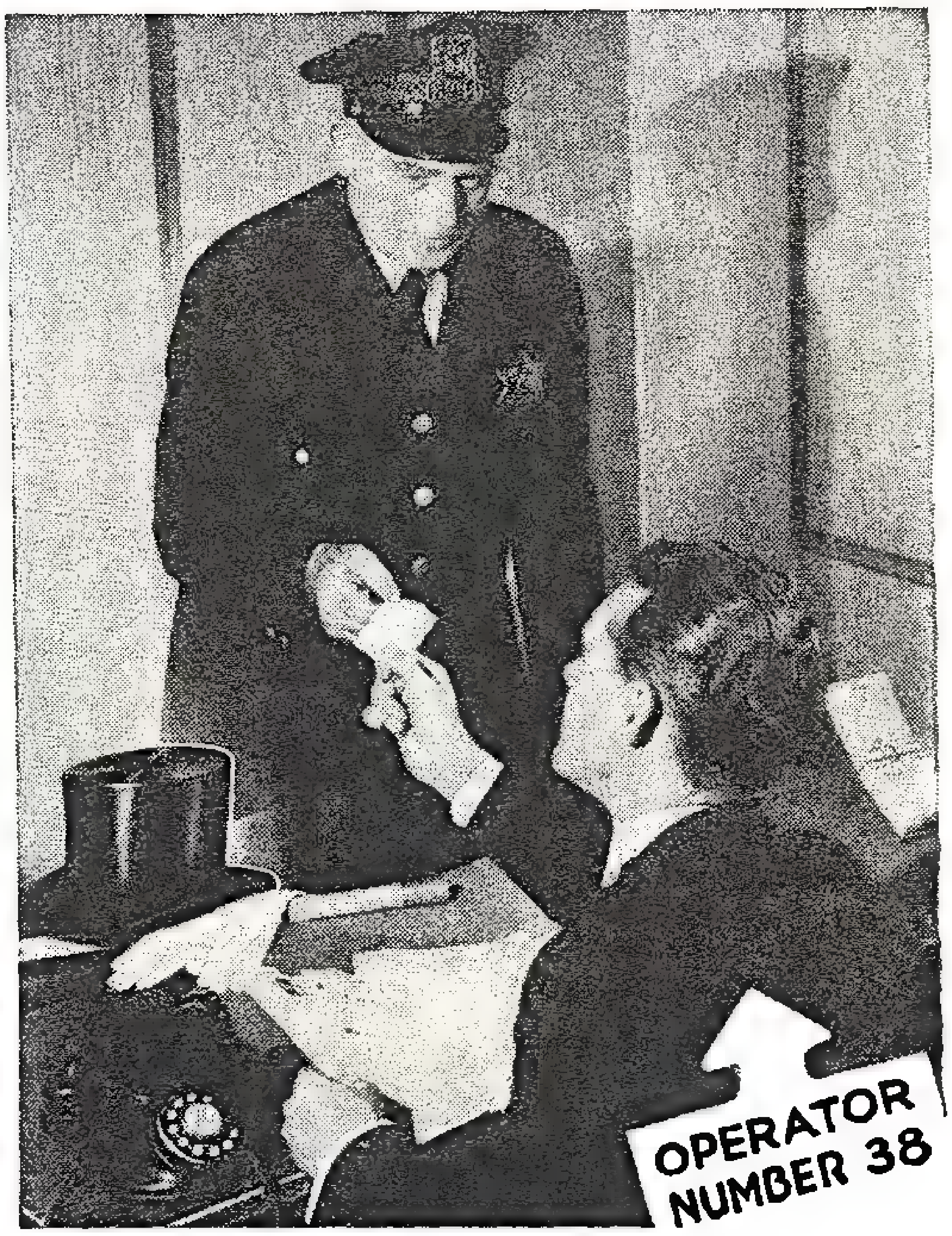
Random Chips: John Wages, Canton, Ill., writes, "Had a lot of pleasure building Sunray (15-foot sloop) from your plans and more now sailing it. I used Duco White on the sides, and she gleams like porcelain. After having one deck covering crack or alligator, I used nitrate dope on the next, soaking the deck first and then laying the canvas while wet. I applied three more coats of dope and finished with three coats of Duco Nile Green." From Lee's Summit, Mo., Norman Wilt writes to describe his version of Handy Henry tractor, "We built it of a Star 4. It has a Republic truck differential and a Star transmission. It weighs about 1,200 and will pull a three- or four-horse load." Jack Story of Butte, Neb., is another midget car fan. He says, "I went through all the MM's from 1933 on, got all the car plans, and used what suited my purpose best. The result was successful."

***

The new Workshop photo contest announced last month is now in full swing, with September 1 as the last day on which entries can be mailed. If you haven't submitted your photo yet, it's time to get busy. What the judges want is a photograph of your workshop, showing its layout and your equipment to best advantage. If you have discovered a way of making a small space do a great deal of work, be sure your photograph brings that point out. Use photoflood lamps or photoflash bulbs to insure good results. There is a first prize of $15, a second prize of $5 and five third prizes of $1 each. As many of the photos will be published in MM as possible.

Arrest Him, Officer!

I'LL HAVE COMPLETE FACTS ON THE OTHER FELLOW TONIGHT!



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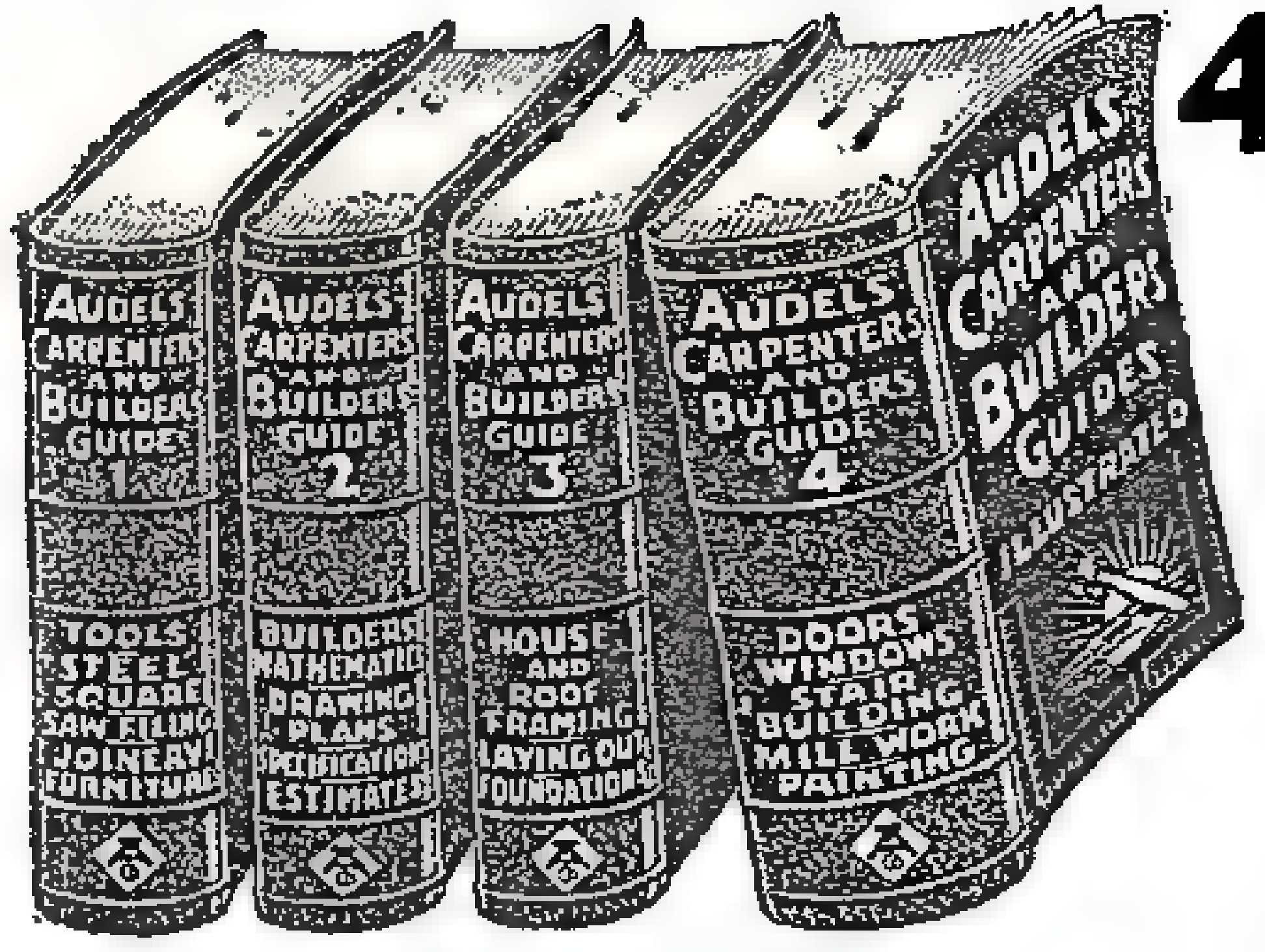
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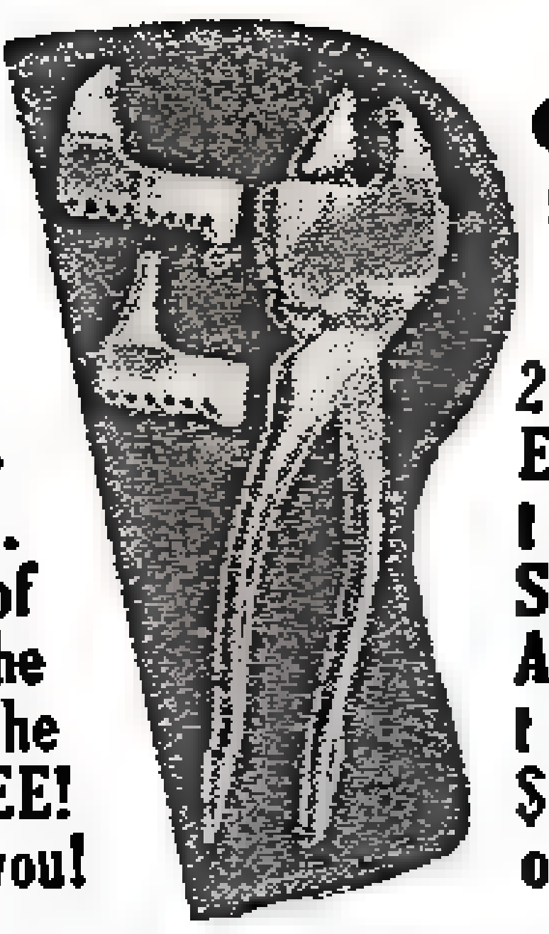

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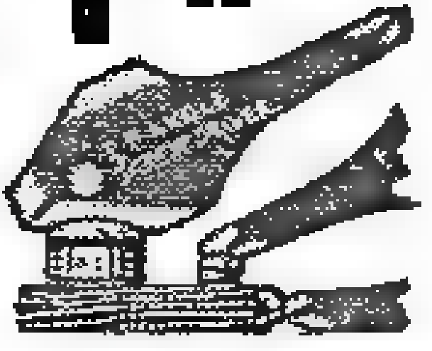

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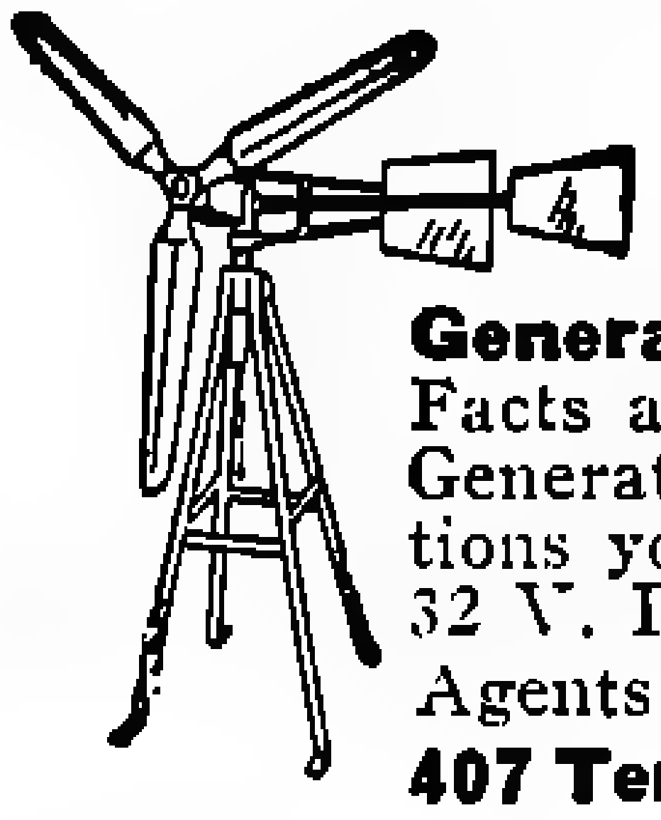

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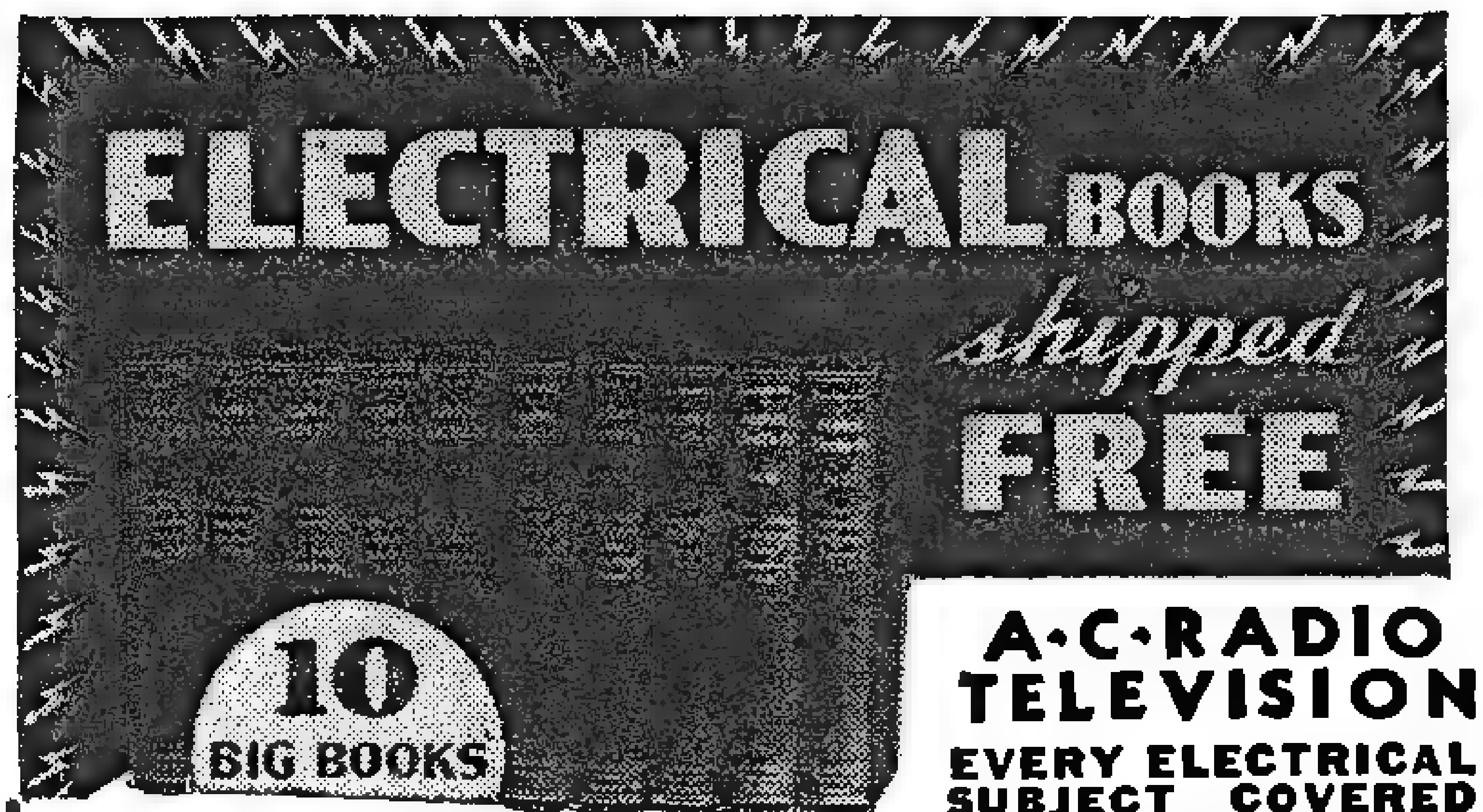

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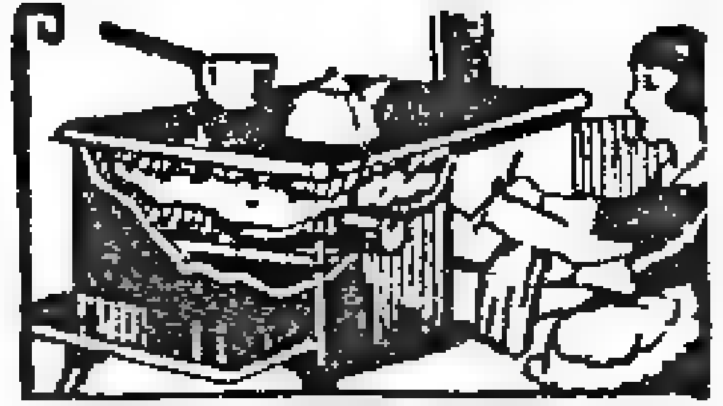

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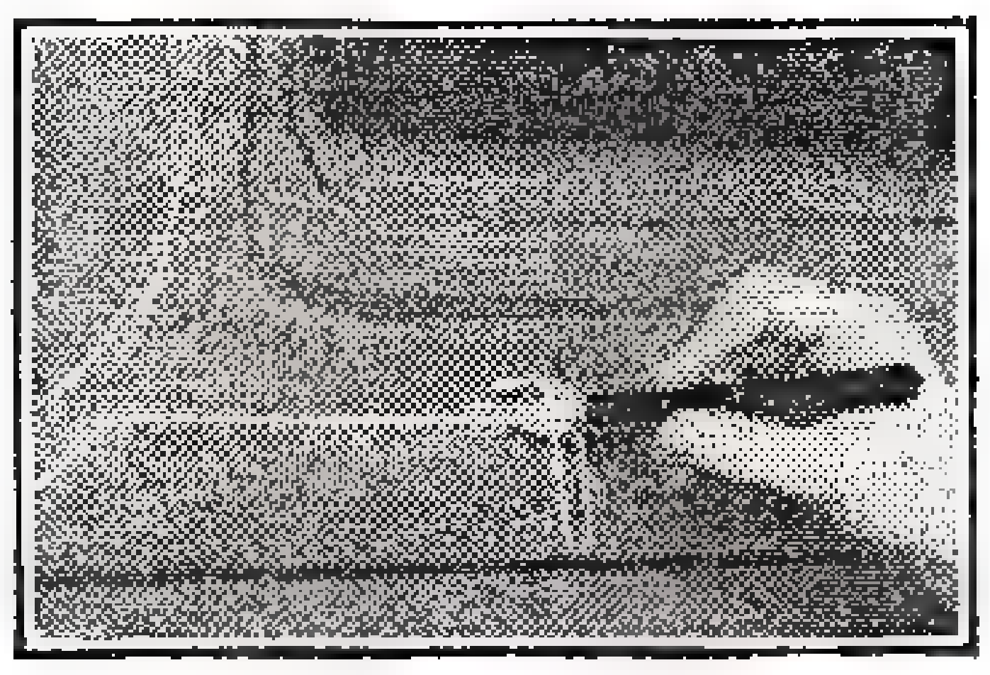

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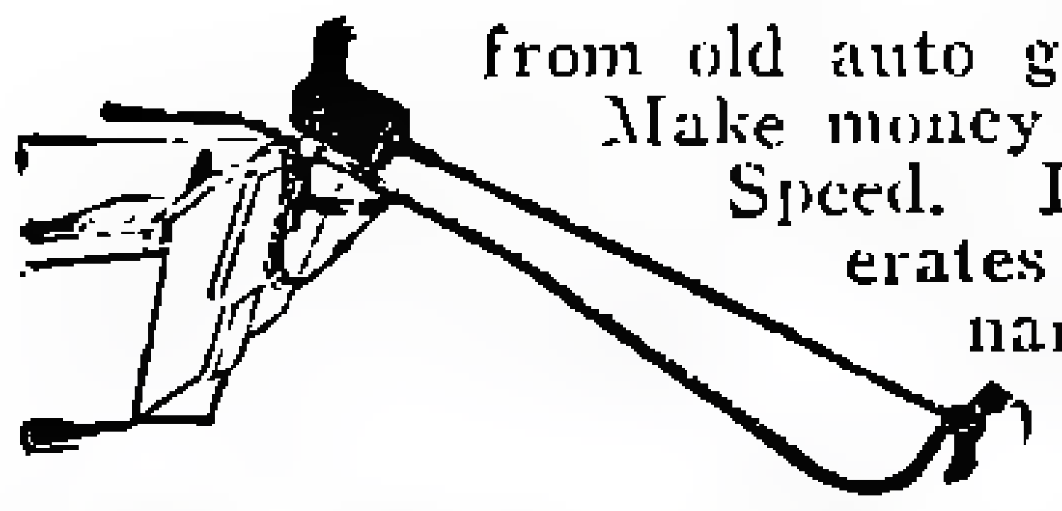

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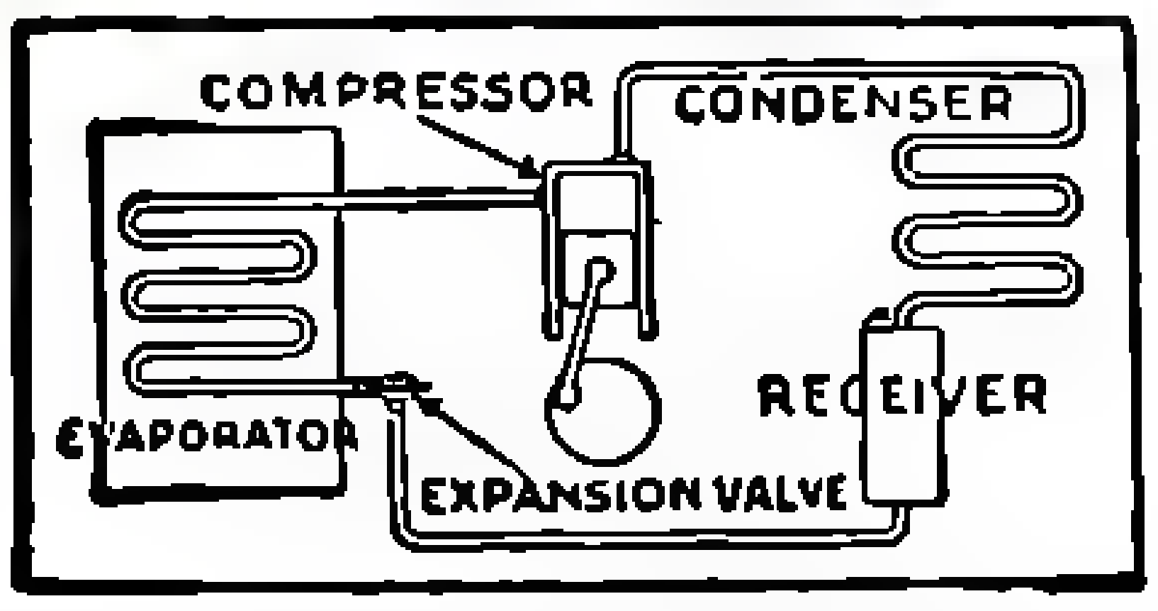

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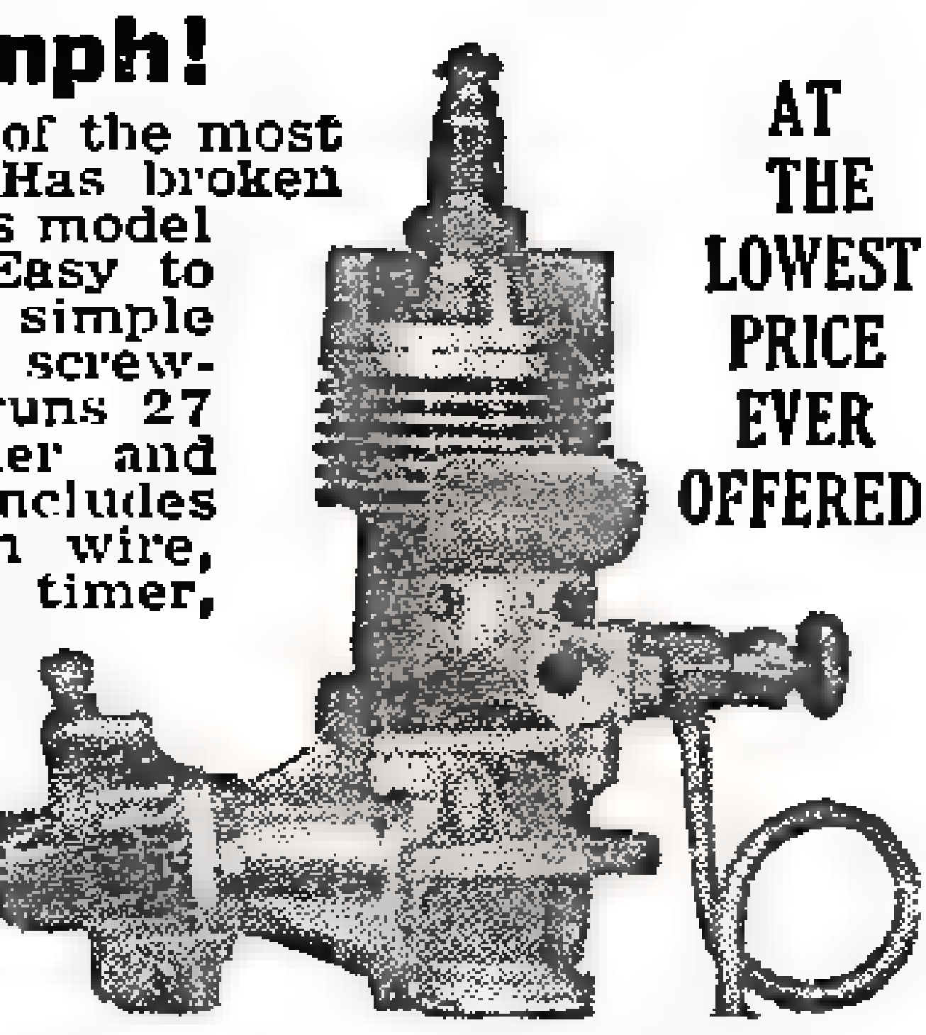

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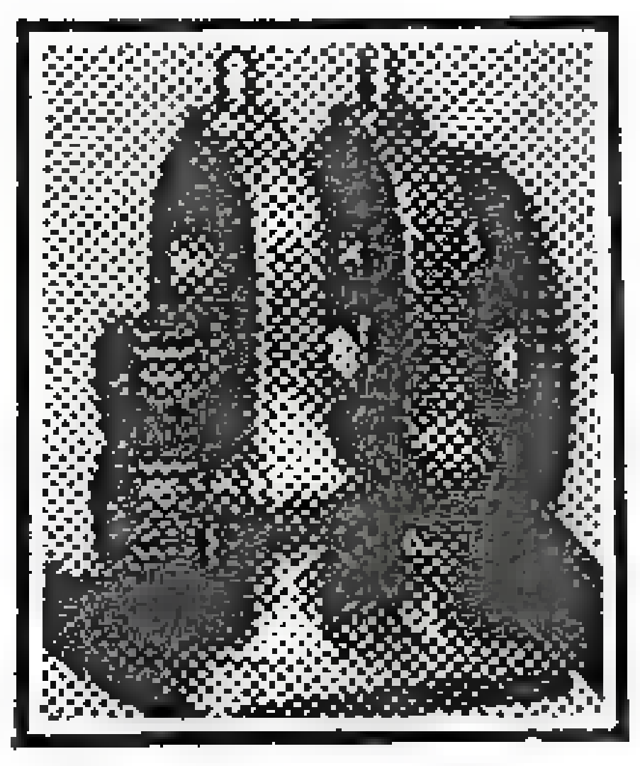

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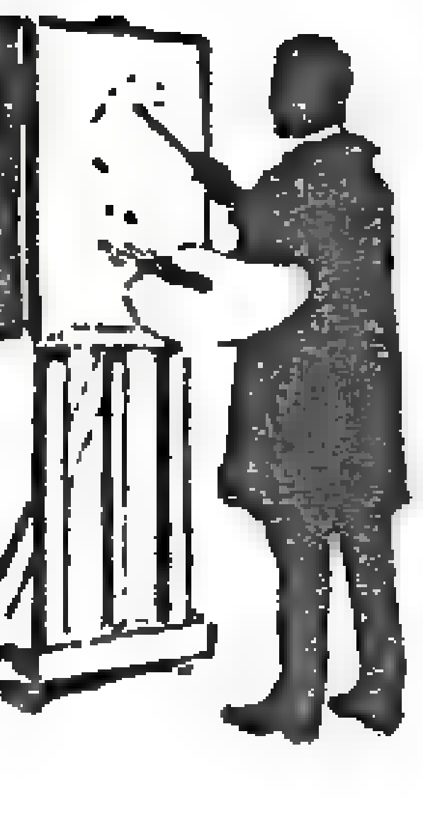

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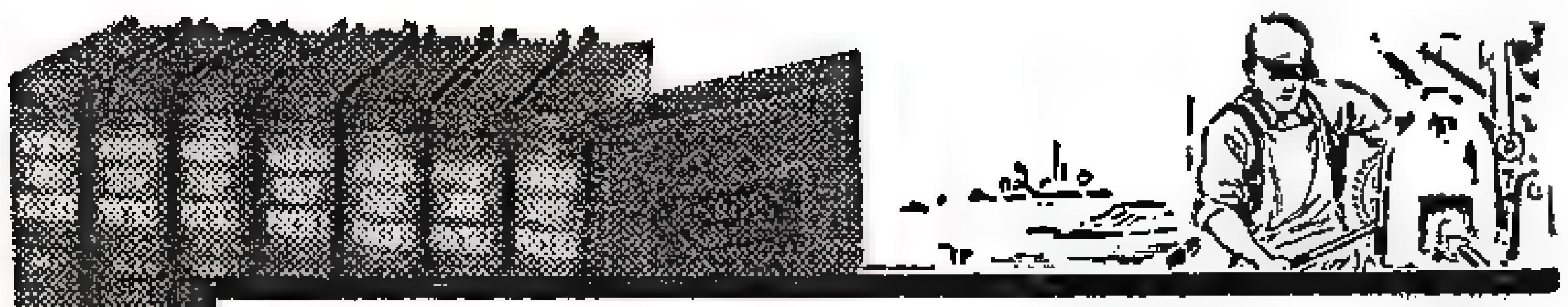

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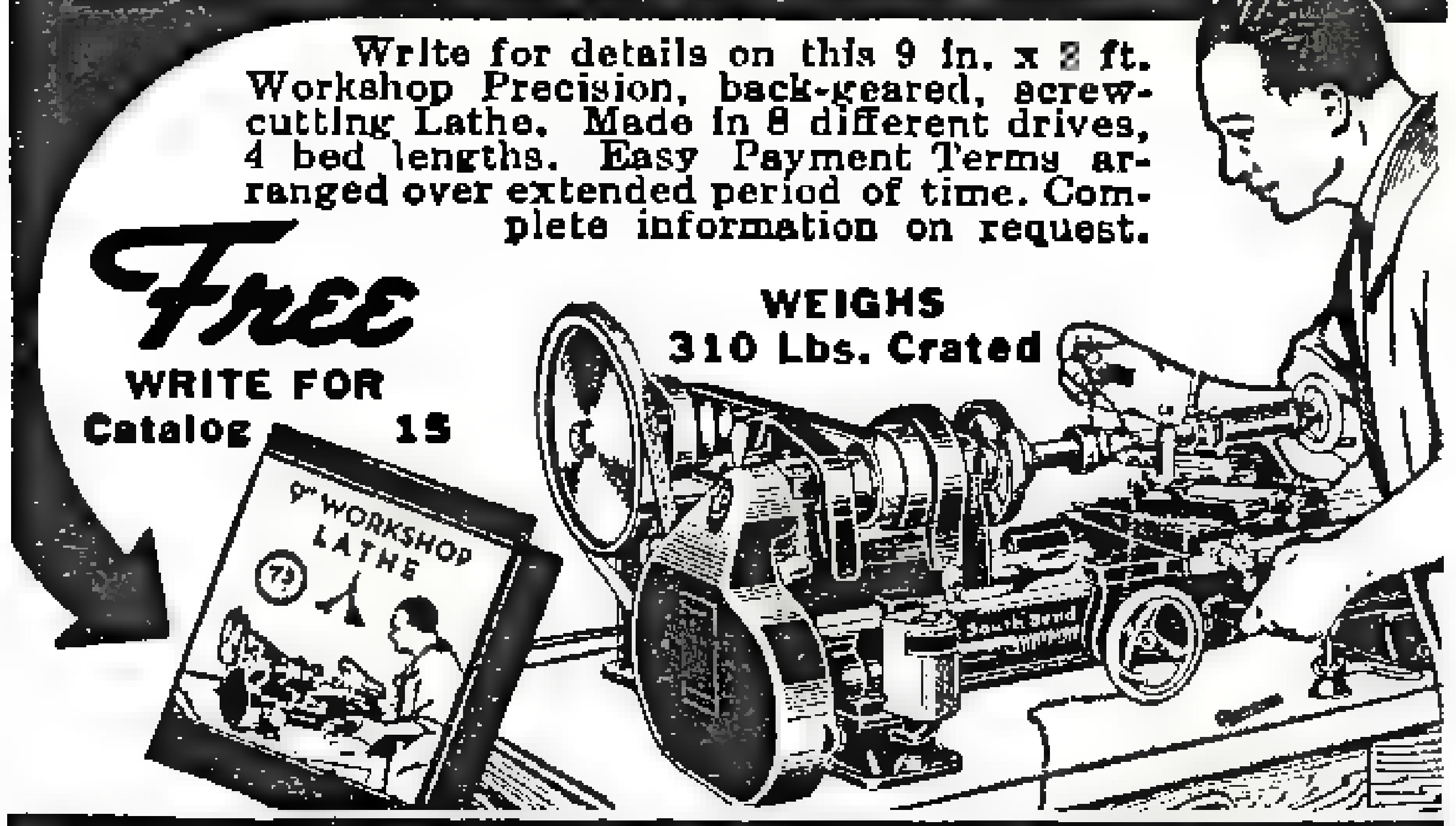

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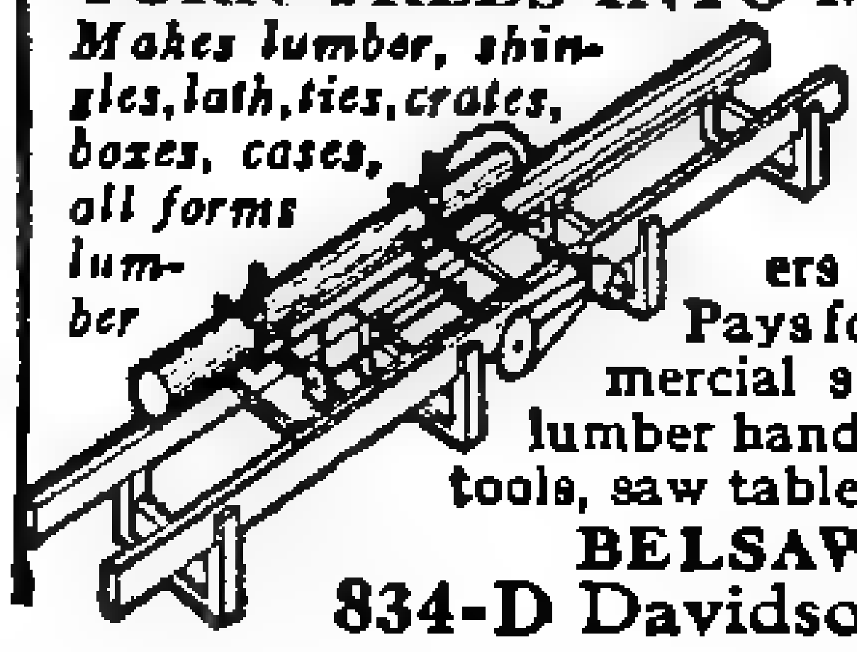

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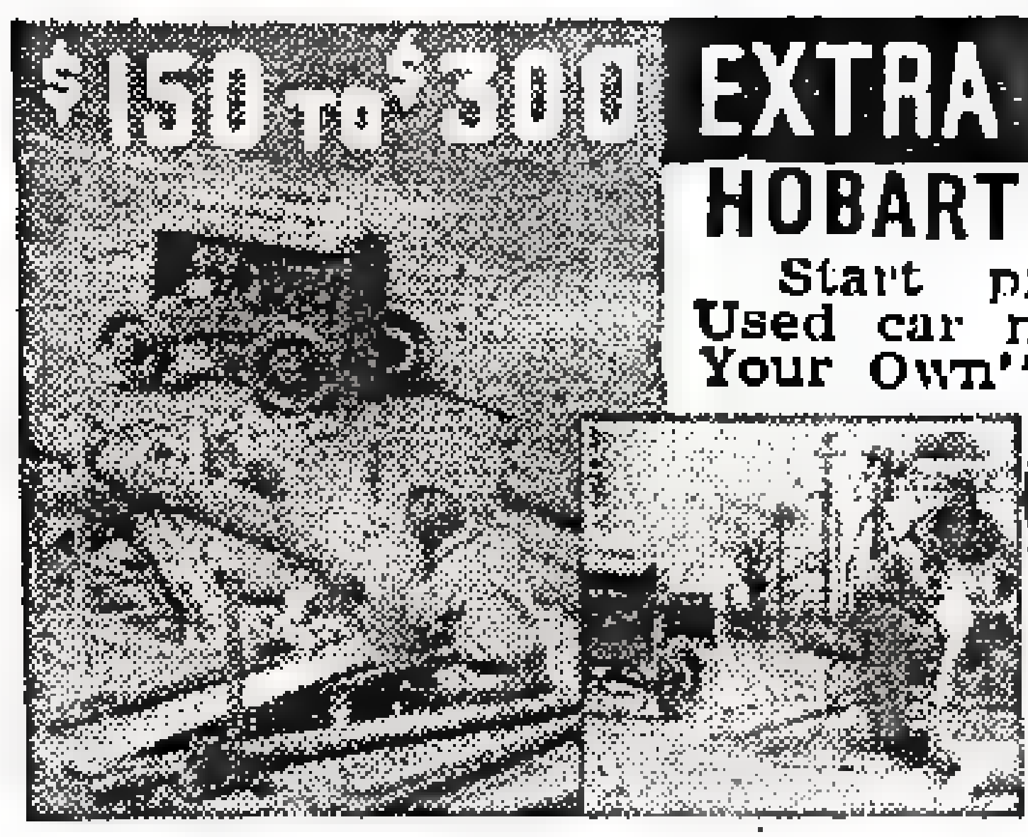

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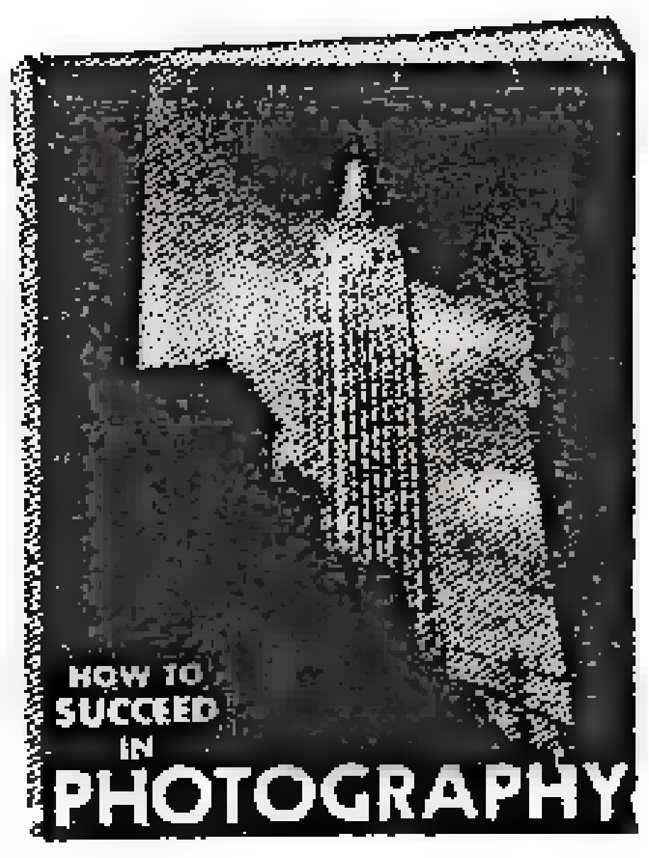

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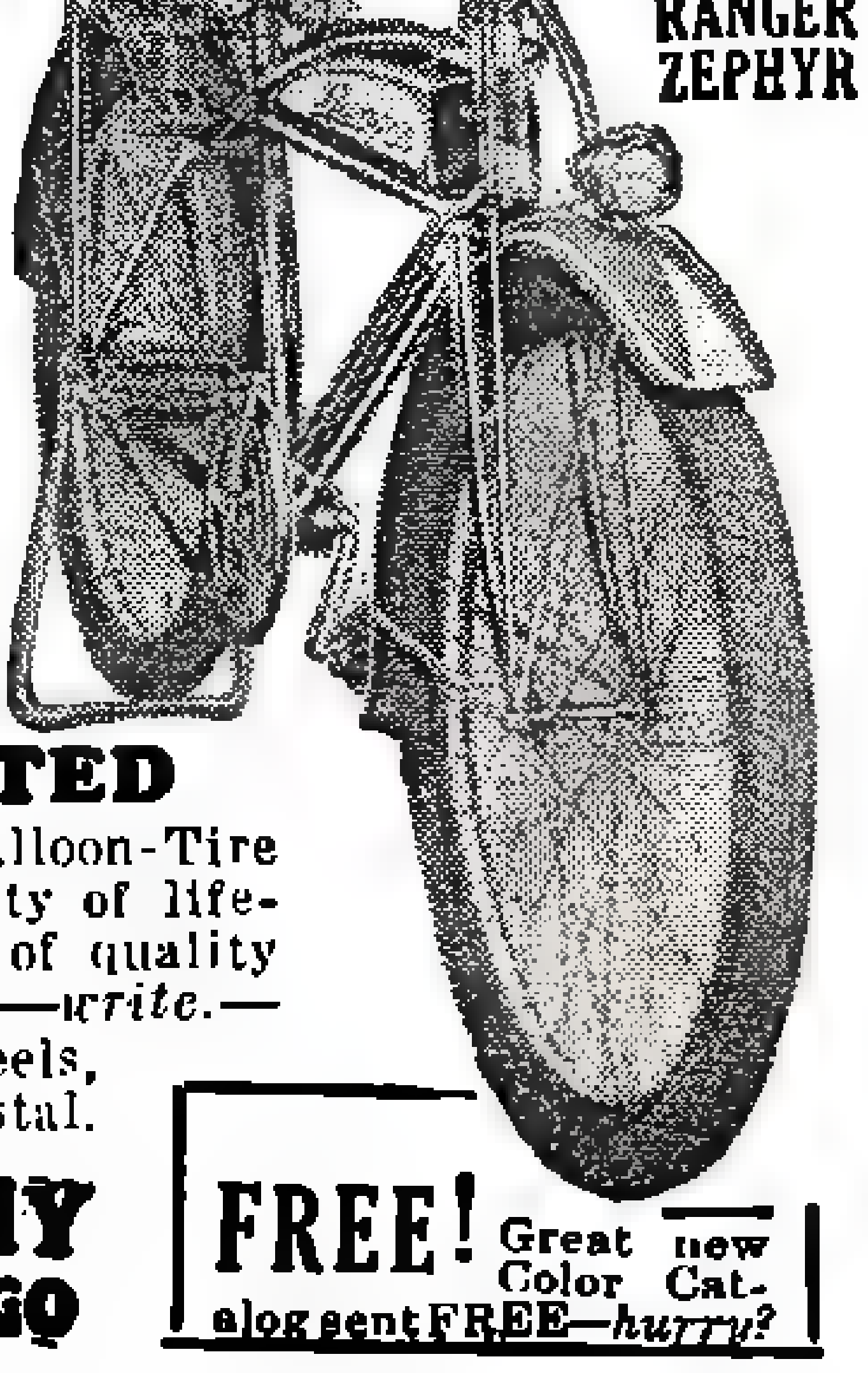

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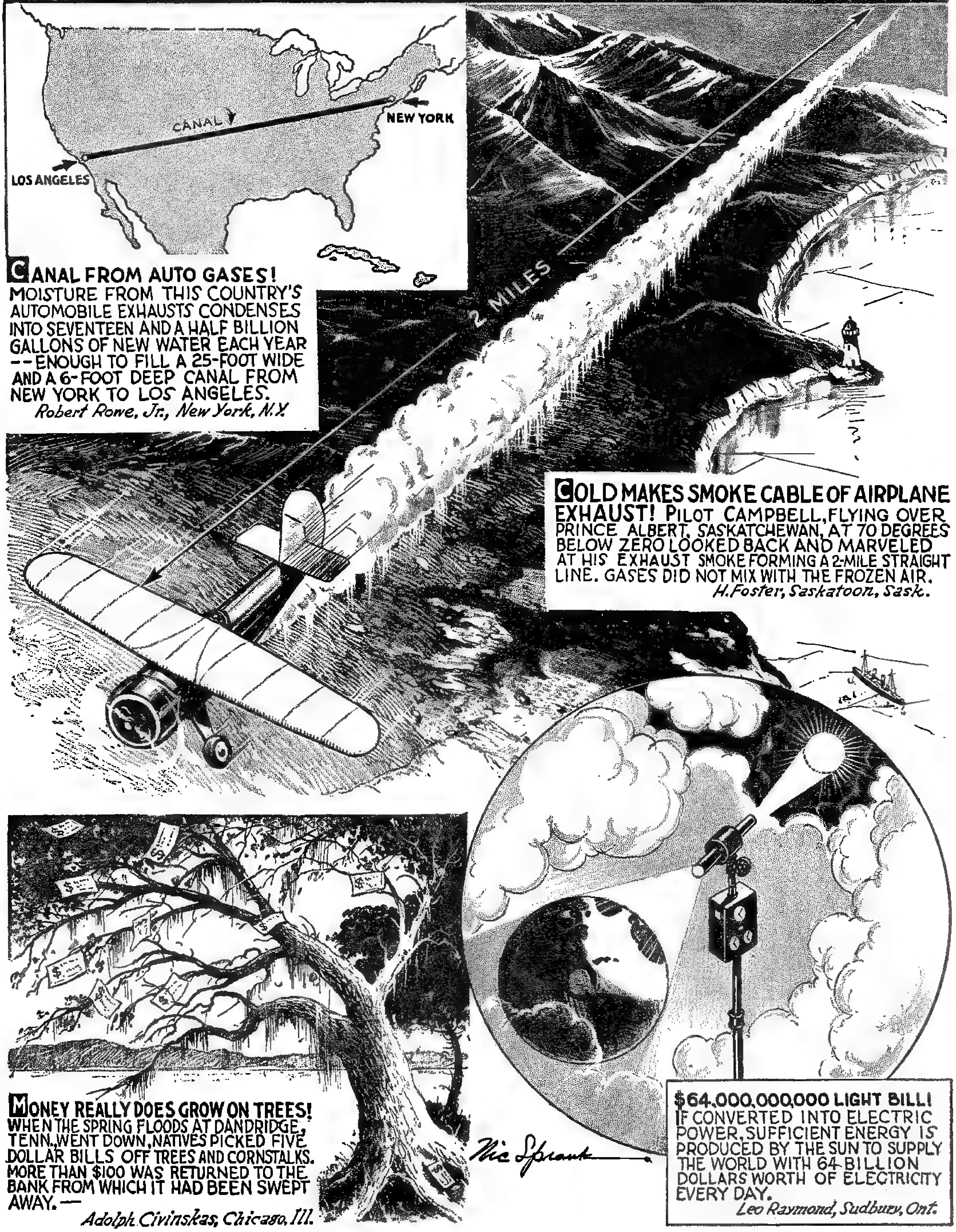

CANAL FROM AUTO GASES! MOISTURE FROM THIS COUNTRY'S AUTOMOBILE EXHAUSTS CONDENSES INTO SEVENTEEN AND A HALF BILLION GALLONS OF NEW WATER EACH YEAR --ENOUGH TO FILL A 25-FOOT WIDE AND A 6-FOOT DEEP CANAL FROM NEW YORK TO LOS ANGELES.

Robert Rowe, Jr., New York, N.Y.

COLD MAKES SMOKE CABLE OF AIRPLANE EXHAUST! PILOT CAMPBELL, FLYING OVER PRINCE ALBERT, SASKATCHEWAN, AT 70 DEGREES BELOW ZERO LOOKED BACK AND MARVELED AT HIS EXHAUST SMOKE FORMING A 2-MILE STRAIGHT LINE. GASES DID NOT MIX WITH THE FROZEN AIR.

H. Foster, Saskatoon, Sask.

MONEY REALLY DOES GROW ON TREES! WHEN THE SPRING FLOODS AT DANDRIDGE, TENN., WENT DOWN, NATIVES PICKED FIVE DOLLAR BILLS OFF TREES AND CORNSTALKS. MORE THAN $100 WAS RETURNED TO THE BANK FROM WHICH IT HAD BEEN SWEPT AWAY.—

Adolph Civinskas, Chicago, Ill.

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Leo Raymond, Sudbury, Ont.

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FRONTIERS of SCIENCE

(A Guest Editorial)

David Sarnoff

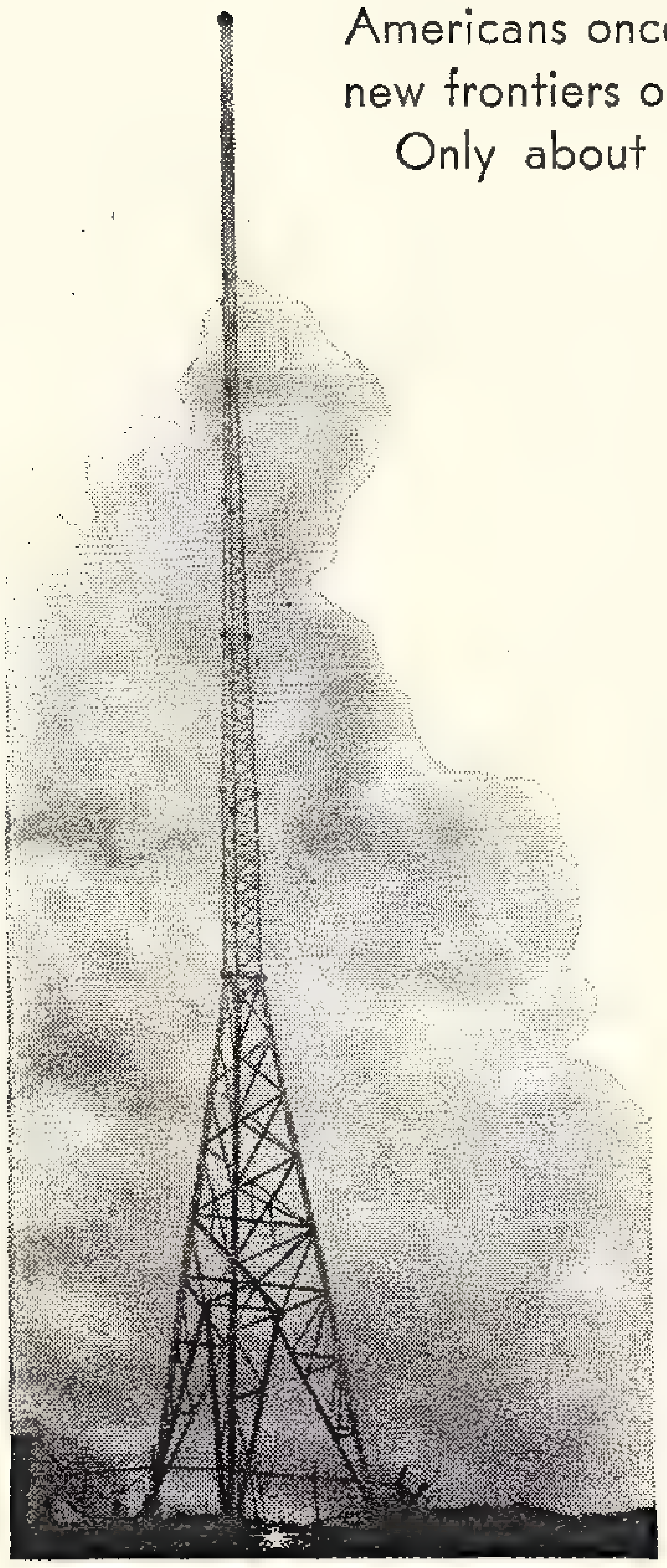
UNTIL our own generation the wealth of the world came from below the surface of our globe—from the mines and waters and fertile soils. It is only in the last 30-odd years that humanity has begun to reach upward for new wealth—upward into the air, into the stratosphere. Already, we have made an impressive beginning with aviation and radio.

It is only a small beginning, but one could speculate at length on the potential resources that still lie untouched in ultra-short waves, in sun-energy and in the stratospheric lanes. Americans once faced the frontiers of geography. Today, we face new frontiers of science.

Only about one-half the human race is, at present, within the orbit of industrialized civilization. Untapped resources of science may soon bring the other half into this sphere, may create immense new producing and consuming areas and provide greater scope for growth and general world-wide enrichment than we now dare imagine.

I believe that the solution of the world's economic problems will yet be found through the progress of science.

For a full, unhampered development, we must have freedom of thought, freedom of action, rewards for initiative, for work, and for achievement—in brief, a democratic system of living and of government.

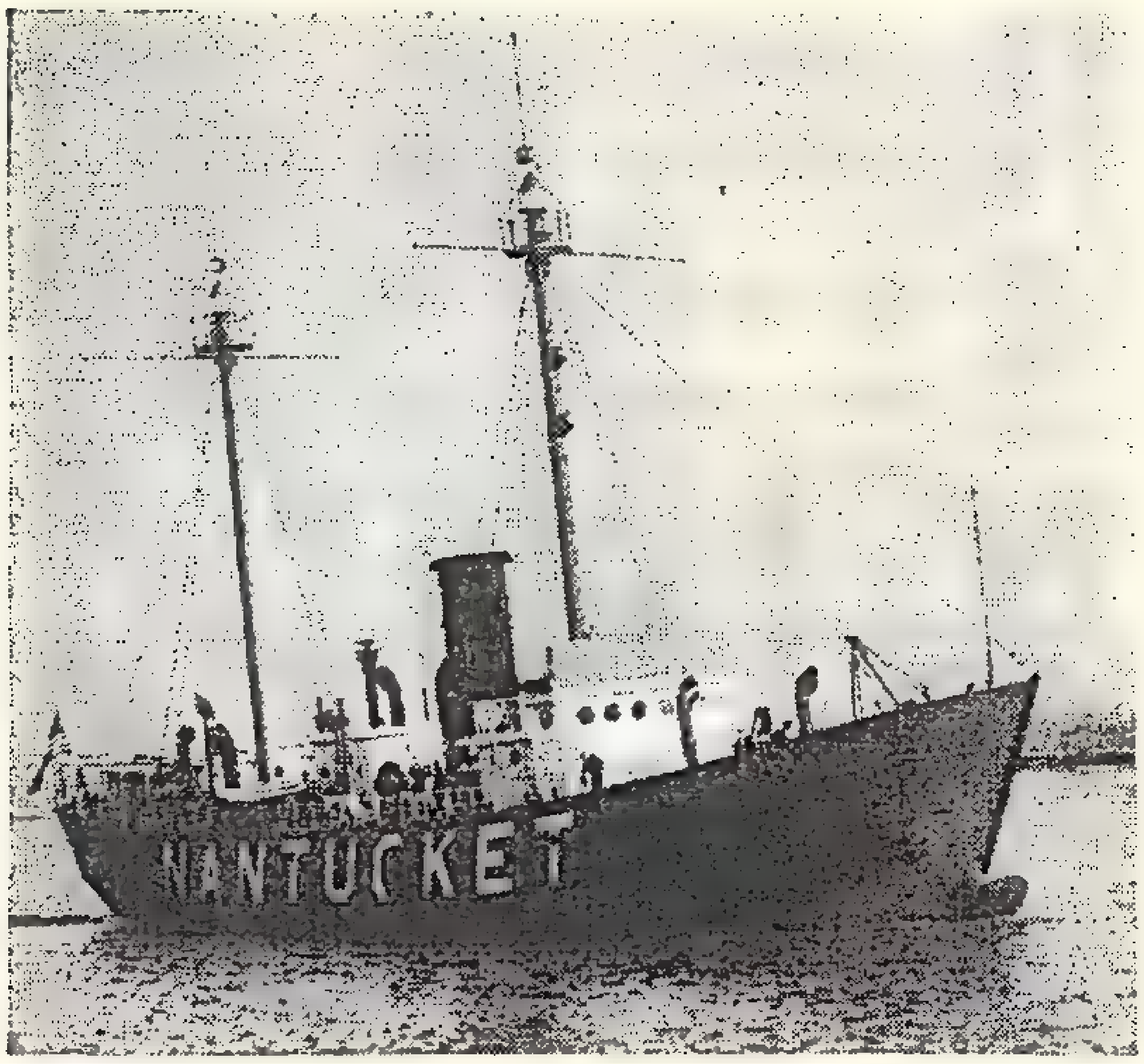


David Sarnoff

PRESIDENT

Radio Corporation of America

Short-Wave Radio Beam Protects Lightship From Ramming



Submarine oscillators, short-wave radio beams, fog horns, and powerful searchlights will guard this new lightship from the danger of being rammed in fog as its predecessor was.

PROTECTED by a special short-range radio beacon that will warn approaching ships of their nearness to her during a fog, a new lightship, No. 112, took her station off the Nantucket Shoals, Cape Cod, on July 1. Its predecessor was sent to the bottom when rammed by the liner Olympic through the lack of such a short-wave beam protection.

The new guardian of the shoals will have many new features including a 16,000-candle-power search light that will flash warnings from her masthead. Powerful automatic fog signals will sound every fifteen seconds and a radio beacon will send out messages that will reach out 200 miles. A submarine oscillator will send out underwater signals that can be heard still farther.

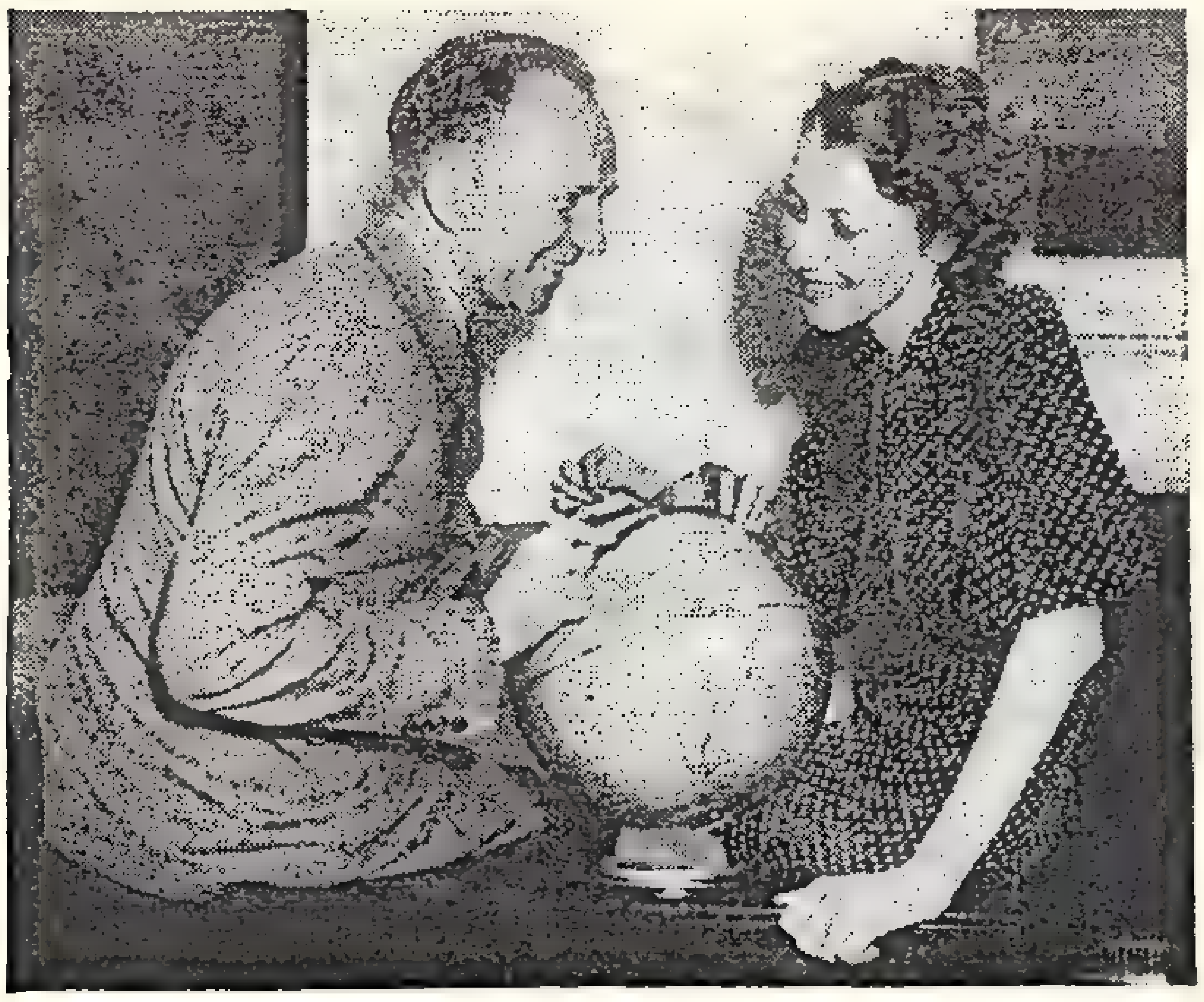
Passageways running to the deck from watertight compartments assure quick exit for the crew in event of danger. The ship carries fuel enough to last for one year.

Chamberlin Plans Strato-Flight

IN A specially designed Lockheed airplane capable of a speed of 400 miles per hour at an altitude of 35,000 feet, Colonel Clarence Chamberlin, noted trans-Atlantic pilot, will attempt a stratosphere flight between the U. S. and England.

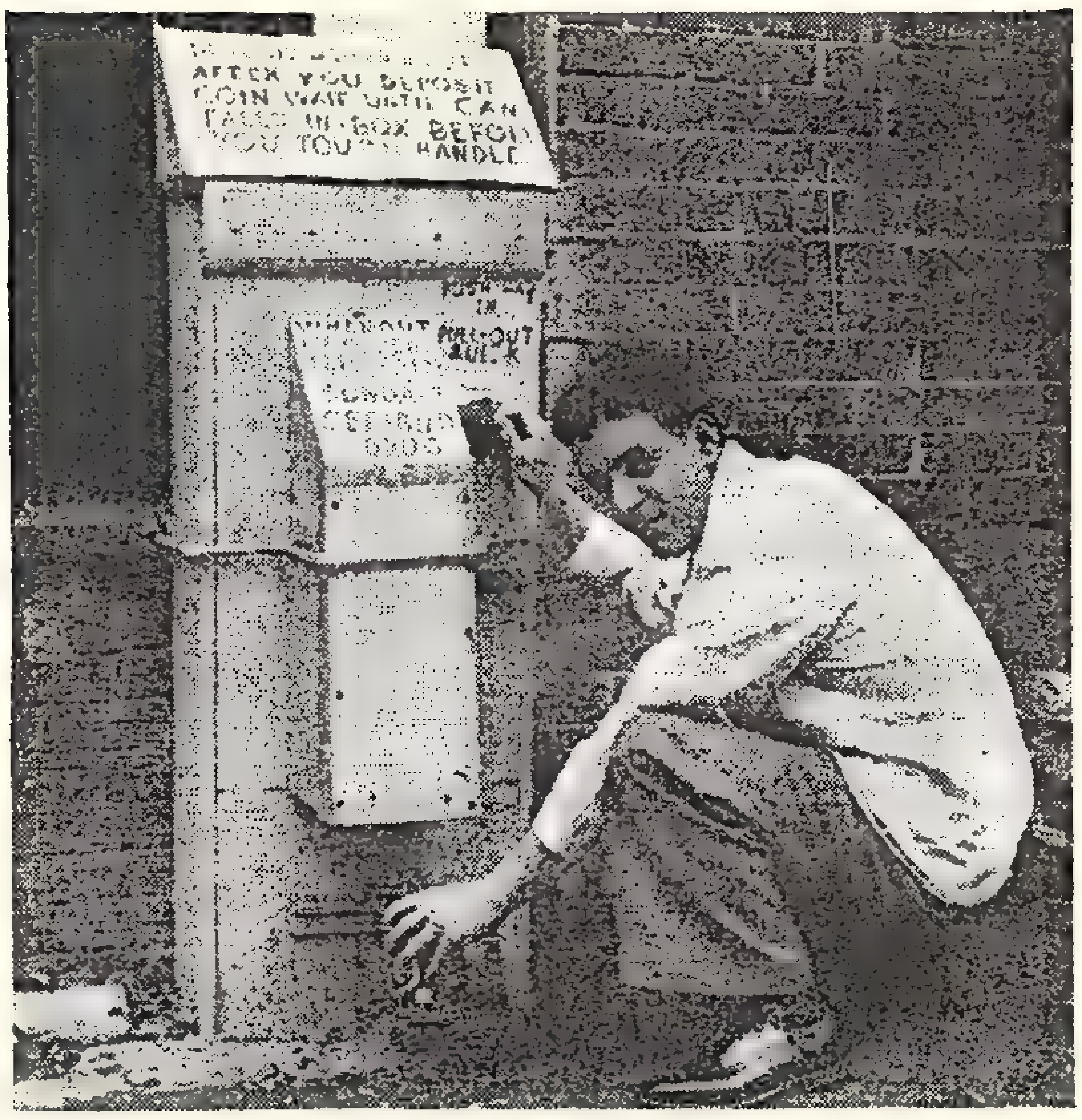
The plane will have double walls and facilities for maintaining the same atmospheric conditions found at 15,000 feet. No oxygen "suit" will be needed for breathing.

The three-bladed propeller of the single-motored plane will have an 11-foot diameter. Chamberlin expects to make the flight in less than six hours.



Clarence Chamberlin, noted trans-Atlantic pilot, plans a U. S. to England stratosphere flight. He will fly at 35,000 feet at a speed of 400 m.p.h. His bride helps plot the course.

Slot Machine Yields Fishing Worms



Here's how the fishing worm slot machine appears in action at Northampton, Mass. The worms come out below.

HERMAN P. DOUYARD, 28-year-old barber fisherman of Northampton, Mass., is the inventor of a unique fishing worm slot machine. All that fishermen have to do is to visit the rear of his shop, drop a coin in a slot and carry away a can of worms. At first Douyard gathered his own worms but pressure of business forced him to organize a staff of ten small boys to handle the production end of the business.

183 SHARE $1000 IN PRIZES!

Meet the prize winners! Bert Pinson, the Texan pictured in the center, is the first prize winner in the big MM Auto Identification contest. Norman K. McWilliams, left, was second and Gwilym Thomas, right, was third. Misses Grace Merrill and Lucile Methe are shown with some of entries.

BERT PINSON, Lubbock, Texas, druggist, wins the $250 first prize in the $1,000 MODERN MECHANIX HOBBIES AND INVENTIONS magazine automobile contest. He earned first place with a perfect entry and "Slow Down Death Begins at Forty" as his slogan. He is 35 years old. Entries were received from as far away as Syria.

Norman K. McWilliams, of Van Dyke, Michigan, wins second prize of $150 in cash on the merits of his entry while third prize of $100 in cash goes to Gwilym Thomas, of New York City.

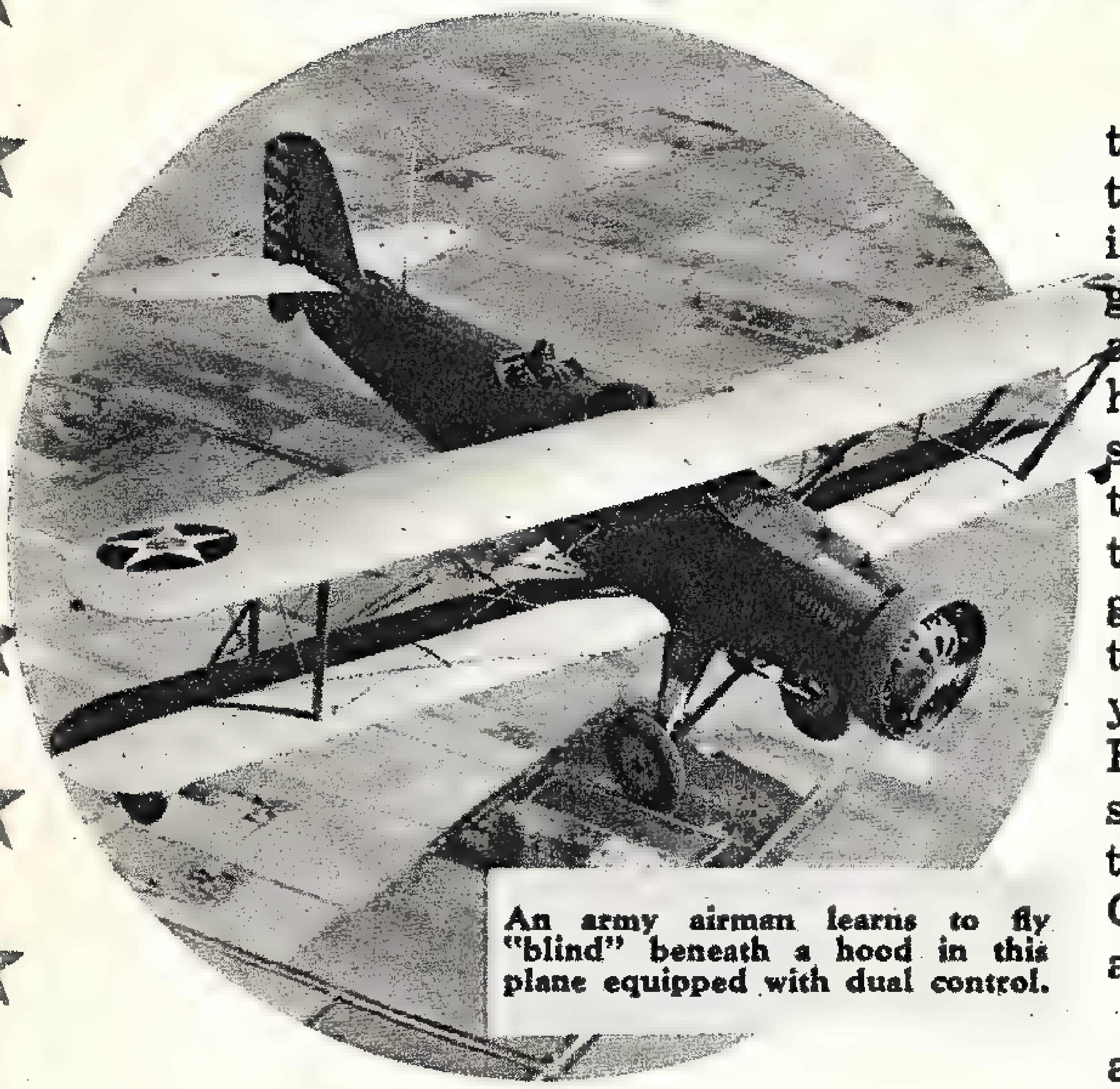
Winners of fourth prizes of $25 each: A. G. Wuertz, Tampa, Fla.; George W. Ronald, Jr., Minneapolis, Minn.; Clayton Protzman, Detroit, Mich.; J. L. Hutchinson, San Francisco, Cal.; and Weber English, Elgin, Ore.

Fifth prize winners $10 each: George Smar, address omitted; Mrs. J. L. Nederhiser, Medford, Ore.; Bernard W. Skinner, Rochester, N. Y.; Saliba Sallum, Beirut, Lebanon; Albert J. Donnell, Kansas City, Mo.; Henry B. Campbell, Buffalo, N. Y.; Dr. A. J. Simpson, St. Paul, Minn.; Neal C. Monroe, Eureka, Cal.; Ira Sitkin, Lewistown, Pa.; B. Harrison Winfield, Woodcliff, N. J.

Sixth prize winners $5 each: L. J. Landers, Atlanta, Ga.; Mrs. Hazel A. Raught, Lewes, Del.; Mrs. Martin D. Haney, Akron, Ohio; Mildred A. Bradley, Sheldonville, Mass.; Joe R. Heimert, Oakfield, Wis.; B. G. Zimpfer, Columbus, Ohio; Herman Henig, Bronx, New York City; T. E. Mueller, Chicago, Ill.; Martin Daly, Buffalo, N. Y.; Oak C. Walker,

[*Continued on page* 125]

TRAINING ARMY



An army airman learns to fly "blind" beneath a hood in this plane equipped with dual control.

A LARGE percentage of each year's graduates of the West Point Military Academy enter the autumn class at the Air Corps Training Center, Randolph Field, Texas. This fact, and the further fact that the flying school is conducted along lines similar to the Military Academy, has caused this Air Corps school to be popularly termed "The West Point of the Air."

The colors come down at retreat ceremonies in front of the Administration center at Randolph Field. This structure is typical of the distinctive architecture of the various buildings at the post.

The mission of the West Point of the Air is to turn out young military pilots competent to undertake the duties of second lieutenant in an Air Corps tactical squadron. The organization of the combat squadrons requires a high ratio of young pilots to officers of higher grades. This ratio is maintained by sending each year from 200 to 250 pilots, trained at the Air Corps Training Center to tactical squadrons of the regular army. The graduates of West Point are officers when they enter the flying school but the other young pilots are continued on active duty as Flying Cadets during one year. If their service shows them to be competent, they are then commissioned as second lieutenants, Air Corps Reserve and given a further year of active duty.

Legislation has been passed recently authorizing the Air Corps to have 1,300 Reserve Officers on extended active duty for periods of five years each. This will enable the selection each year of approximately 270 graduates of the Training Center for duty with tactical squadrons. The proposed law provides for payment, upon discharge from active duty after a minimum of three years active duty, of a bonus of five hundred dollars.

The West Point of the Air is organized to receive new classes at the Primary Flying School every four months. Each class has four months in the "Primary Stage" and four months in the "Basic Stage" at Randolph Field. The "Air Cadets" then move over to Kelly Field for their last four months at the Advanced Flying School, where they are graduated as pilots. During the Primary Stage trainees receive ground in-

This Air Corps photograph shows how the hangars and runways look to the student flying above the clouds.

AIR ★ ★ ★ FIGHTERS

Student fliers form an aerial "U. S. A." with their planes over Randolph Field in Texas.

If you would fly for Uncle Sam, read this notable article by the Assistant Chief of the Army Air Corps explaining exacting requirements of life at Randolph Field.

by

BRIGADIER GENERAL H. H. ARNOLD

struction and flying instruction on "Primary Training Airplanes" or PT's, as they are known. In the Basic Stage the flying training is conducted in "Basic Training" or BT airplanes, larger, speedier and more maneuverable airplanes. These provide an intermediate step in piloting between the PT's and the service types such as pursuits, bombardment, attack and observation used in the flying training at the Advanced Flying School.

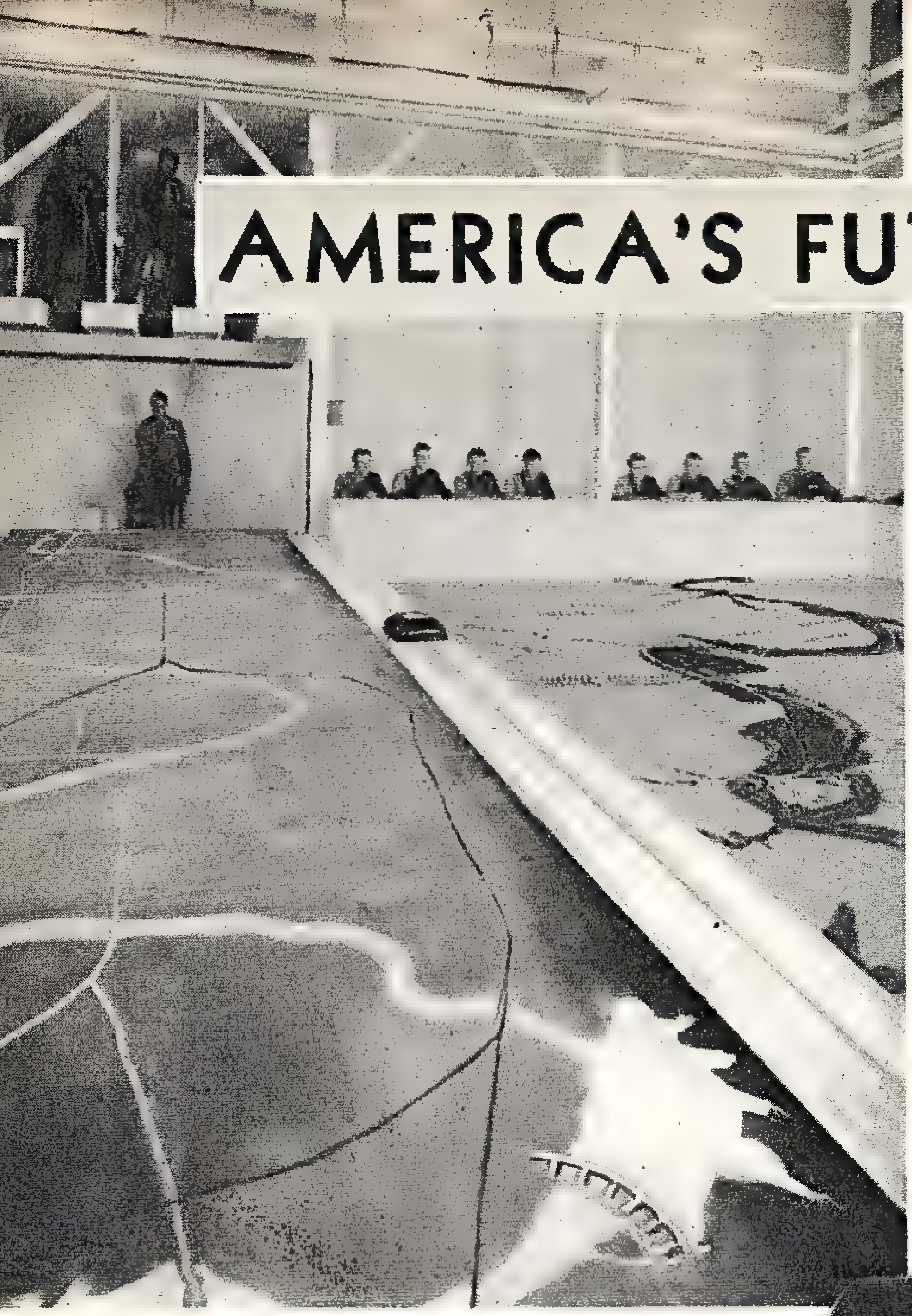
Since a knowledge of the equipment he is flying is essential to the student, and a continuous diet of flying would make a trainee "stale," it is convenient and advantageous to combine with the flight training, ground instruction in airplane engines, theory of flight, radio, ground gunnery, air navigation, meteorology, flight maps, airplane maintenance and other subjects. This ground instruction is continued until graduation. At the Advanced Flying School it emphasizes the tactics of each class of aviation—bombardment, pursuit, attack and observation.

The student body is made up of Flying Cadets and student officers. Each new class consists of approximately 150 men. The class beginning in October of each year usually is composed of from 50 to 80 second lieutenants from the graduating class at West Point. The Flying Cadets in this class therefore are reduced to such number as to make a total for the class of approximately 150. The Flying Cadets, with the exception of a few ex-enlisted men from the army, are drawn entirely from civil life.

Future Army airmen pictured as they arrive to start instruction at the "West Point of the Air."

In the period of one year at the Training Center the young student receives a total of 323 hours flying instruction. For the fiscal year 1935 the flying for the

AMERICA'S FUTURE ACES STUDY



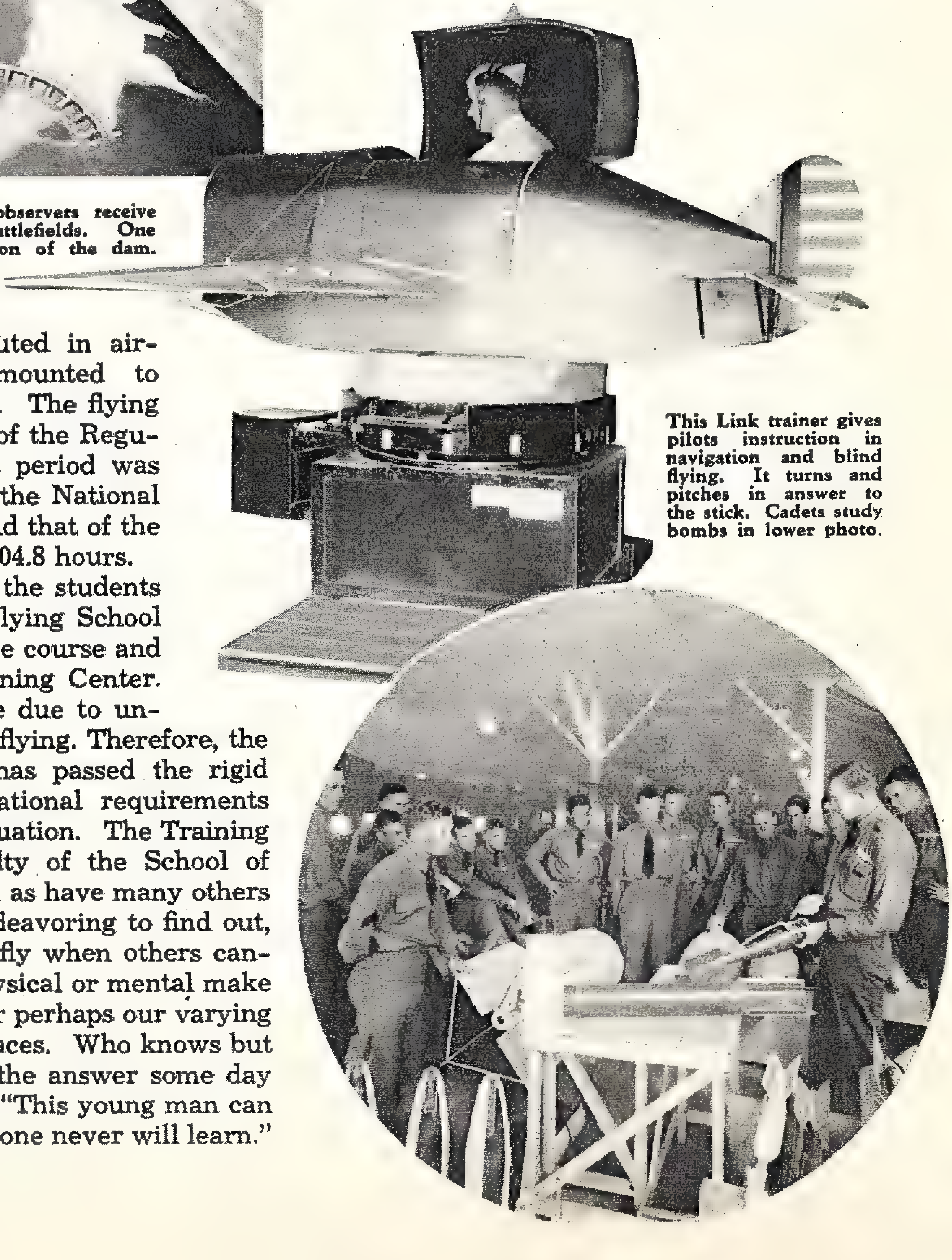
Future bombers and artillery observers receive practice on these miniature battlefields. One problem calls for the destruction of the dam.

The Flying Cadets are all young, unmarried citizens, between the ages of 20 and 27, inclusive, of good character, sound physique, and who have had at least two years of college work. If lacking the required educational credentials, they must demonstrate their proficiency by successfully passing examinations in United States history, English, general history, geography, higher algebra, geometry, trigonometry, and physics. The educational equation is simplified for many of these aspirants by their possession of diplomas and degrees from the country's many colleges and universities.

Professionally, these trainees are from all walks of life. Geographically, all states in the

Training Center, computed in airplane flying time, amounted to 113,802.8 airplane hours. The flying time for the remainder of the Regular Army for the same period was 312,575.4 hours, that of the National Guard 40,606.7 hours, and that of the Organized Reserves 23,204.8 hours.

About 45 per cent of the students entering the Primary Flying School successfully complete the course and graduate from the Training Center. Most of the failures are due to unsatisfactory progress in flying. Therefore, the fact that a candidate has passed the rigid physical and the educational requirements does not insure his graduation. The Training Center, and The Faculty of the School of Aviation Medicine, now, as have many others during the past, are endeavoring to find out, "why can some people fly when others cannot." Is it heredity, physical or mental make up, diet, habits of life, or perhaps our varying inherent fear of high places. Who knows but perhaps they will find the answer some day and say with certainty, "This young man can be taught to fly but this one never will learn."



This Link trainer gives pilots instruction in navigation and blind flying. It turns and pitches in answer to the stick. Cadets study bombs in lower photo.

MINIATURE BATTLEFIELDS

United States are represented, with occasional applicants from our various foreign possessions. Students from foreign countries are frequently included in the student officer classification. However, regardless of their former occupations, or their native country, all are trained alike—all live in accordance with the same rules and regulations.

During the interval embraced by the dates of October 15, 1931, and March 1, 1935, a total of 2,022 would-be pilots have reported to the Air Corps Primary Flying School. During that period there were 20 foreign students who came from countries as follows: 7 from Mexico, 2 Brazil, 2 Philippines, 3 China, 2 Turkey, and 1 each from Germany, Guatemala, Cuba and Colombia.

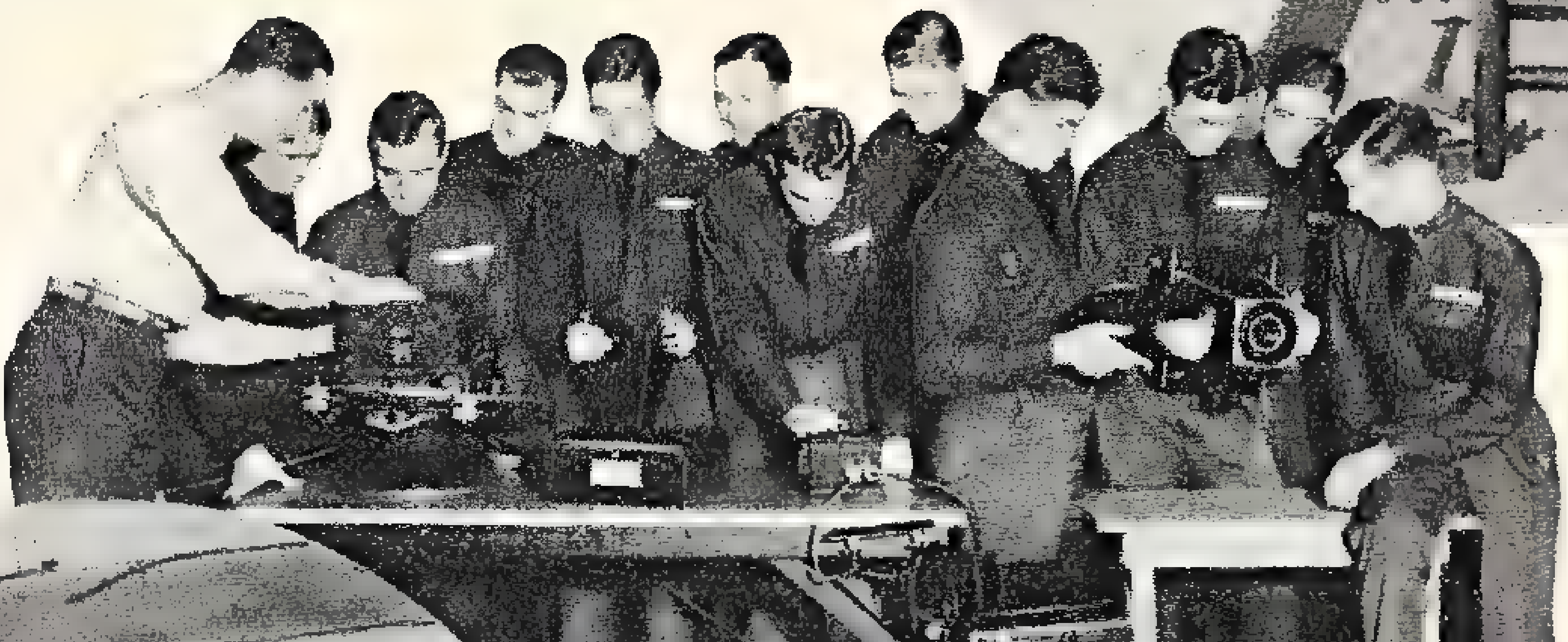
Of the 2,000 cadets who enrolled only five have been killed. This figure deserves especial consideration as it represents the infinitestimal percentage of less than one-half of one per cent of the total number graduated. When compared with similar statistics for training during the war period or with the peace time records of the schools of the armies of other nations, this small proportion is a monumental tribute to the efficiency of the Air Corps training method.

What of the future of the trainee? This answer can be made: Practically all who finish at the Primary Flying School graduate four months later from the Advanced Flying School and following that, the Americans are assigned to Air Corps stations for duty with tactical troops. The Flying Cadet continues in grade for an additional year for seasoning and experience. This is followed by a year, or perhaps two, of active duty as a second lieutenant in the Air Corps Reserve. Upon completion of this period he reverts to his former civilian status, but he may maintain active contact with the service through membership in the National Guard or Organized Reserves. A civilian with this wealth of flying experience behind him, is in a favorable position to seek employment with a commercial aviation company. Then, too, there is the recent possibility

[*Continued on page* 132]

Air Corps Photos

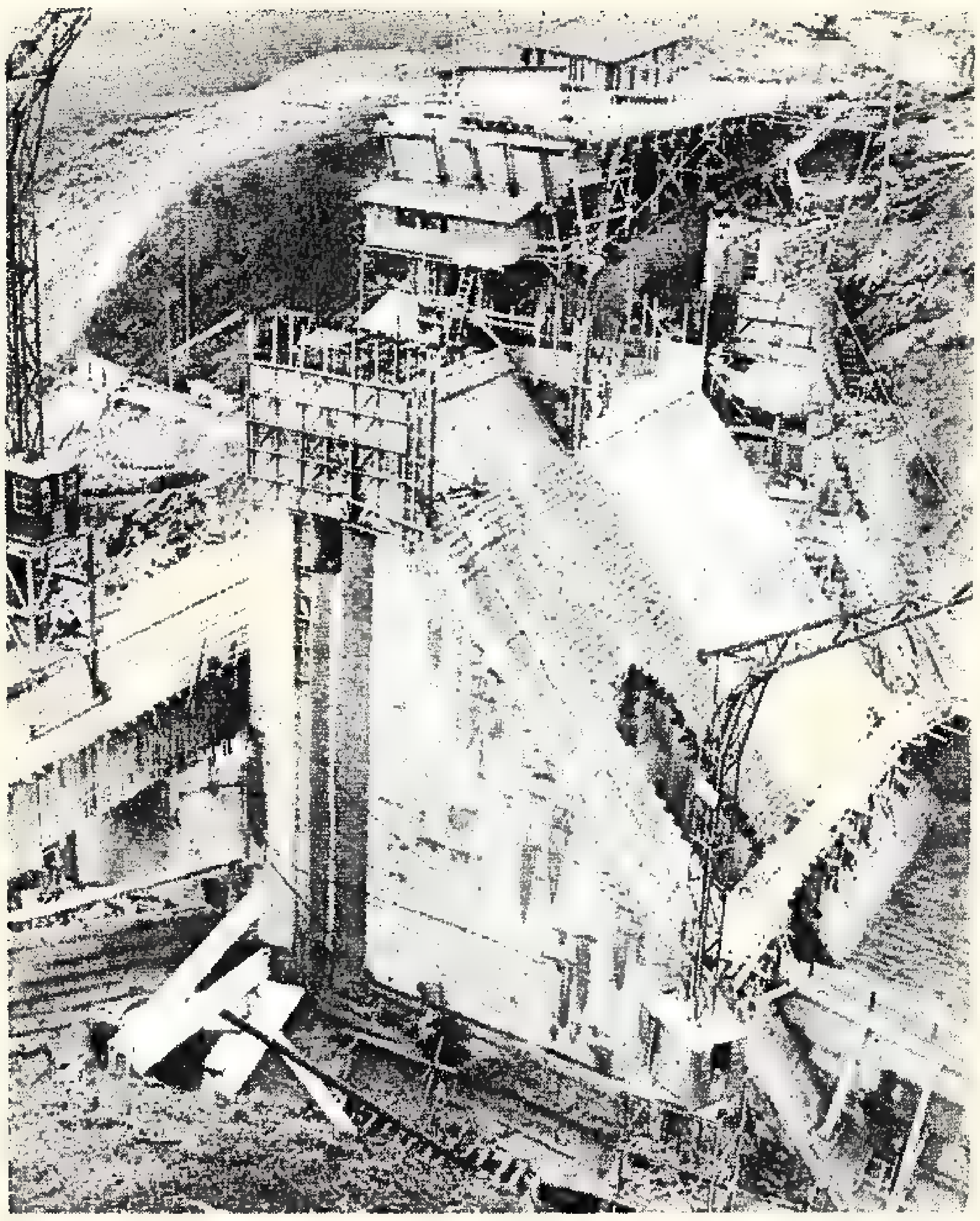
Future airmen relax with checkers and magazines after a busy day with planes, bombs, cameras and difficult formations.



Every army flier must know something about aerial photography. A class is shown studying the various cameras used in map making.

Both wearing parachutes, an instructor prepares to take a student aloft for his first instruction at the "West Point of the Air."

Swiss Run Sihl River Through Mountain For Power Dam



This dam will store the waters of the Sihl River, Switzerland, after the water has been brought under a mountain in a tunnel two miles long which sinks to a 670 foot depth.

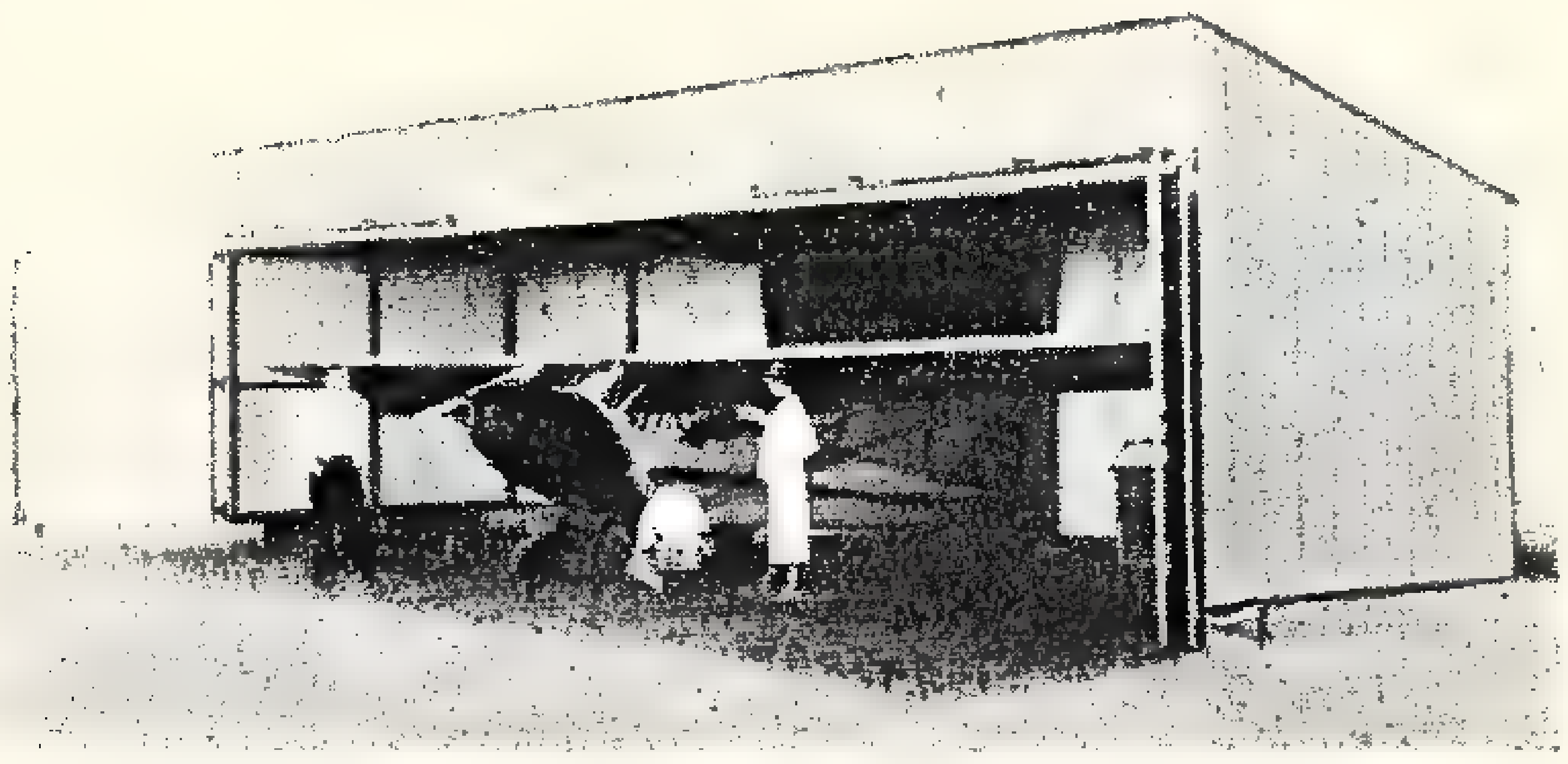
GOETHE, the famous German poet, predicted in the year 1797, that the course of the Sihl River, in Switzerland, would be changed. Today, 140 years later, his vision becomes a reality as engineers prepare to send the river through the mountain near Etzel to create a power plant dam.

High pressure pipes in a tunnel two miles long will carry the stream. The tunnel bores 670 feet under the highest point of the mountain. At the tunnel's end, a dam is being built to form the site of a lake over which a bridge is being placed in anticipation of the day when water will rush through the mountain to make the lake.

Small Plane Hangar Easily Erected

A SMALL steel hangar that can be erected by two men in a few hours time has been placed upon the market. The frame is of wood and steel while the sides, doors and roof covering are made of galvanized iron. Made up of bolted construction it is an easy matter to take down the hangar in the event that the airplane owner should desire a change of location for any reason.

It is claimed that the new type hangars will aid the sales of small aircraft to individual private owners by making a low monthly rental charge possible.



Easily transported and capable of being assembled by two men in a few hours time, this low cost metal hangar will provide ample storage space for the average small airplane.

Wooden Safe Passes Rigid Fire Test

Exposure to fire for a period of one hour failed to damage the contents of this inexpensive safe made of Douglas fir lumber. The wooden safe is of airtight construction.

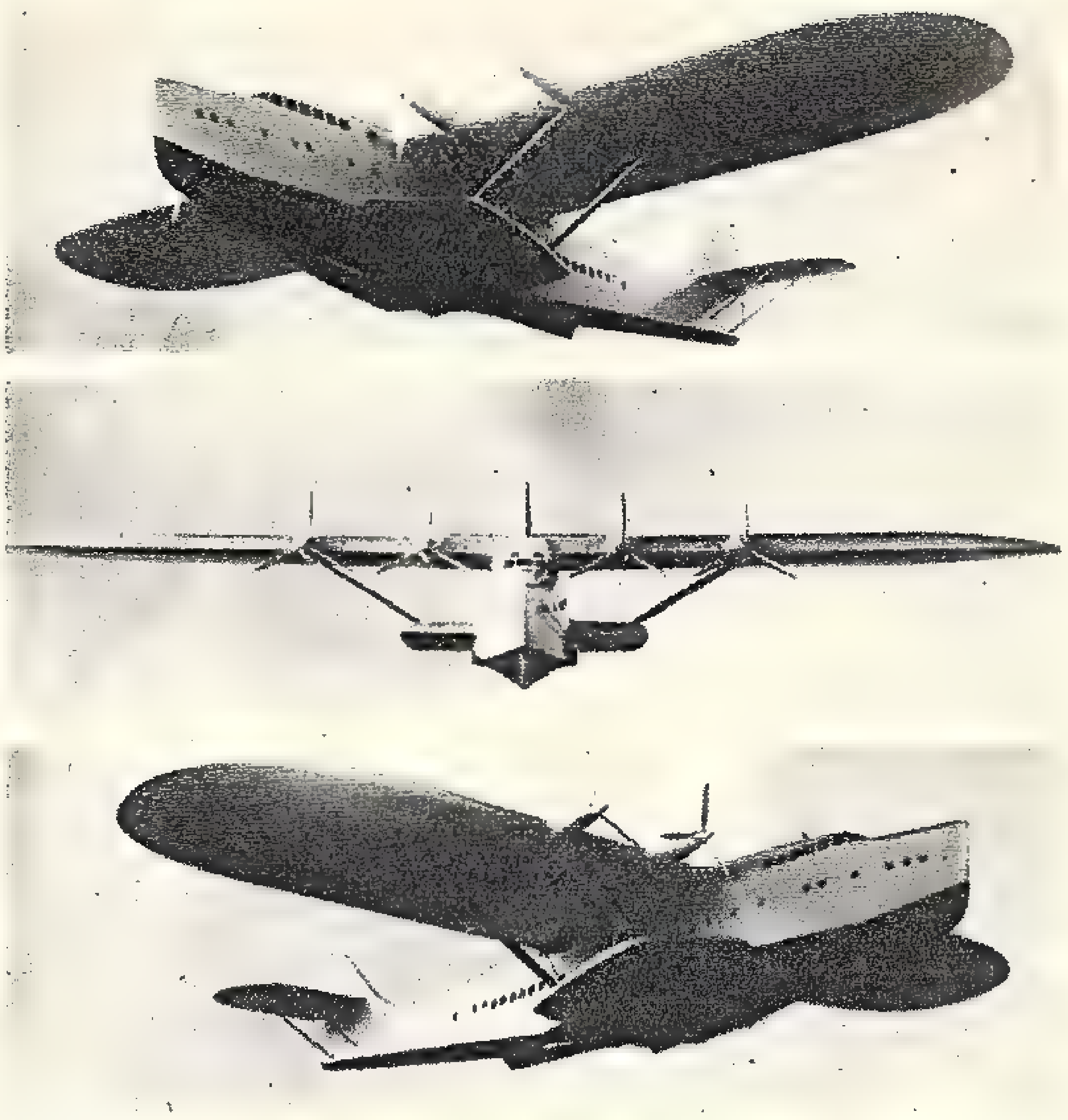
A WOODEN safe that will undergo fire all around it for at least one hour without harm to its contents has been constructed by Prof. T. J. Starker, of Oregon State College. It is made of two-inch thick Douglas fir lumber, is airtight, tongue grooved, and has door edges rabbeted like those found on steel safes.

Super-Flying Boat Powered With Eight 800 H.P. Motors

EIGHT Diesel motors of 800 horsepower each will furnish the tremendous power necessary to launch the new German super-flying boat, DO 20, now under construction at the Dornier Airplane Works at Friedrichshafen.

The new airplane, to be one of the largest of its type in the world, will have a cruising speed in excess of 200 miles per hour. No pontoons will be used to support the wings in landing, all shock being absorbed by stabilizing floats attached to each side of the hull.

It is being built purely for commercial purposes, with extra-large passenger and freight compartments.



Three views of a model of the DO 20, German super-flying boat now under construction at Friedrichshafen. It will be powered by eight 800-h. p. Diesel motors mounted in wings.

Student Makes Smallest Radio Tube

Chao-Ying Meng, Chinese research fellow of the Rockefeller Foundation is shown with the world's smallest radio tube which he built. It generates the world's shortest wave length.

THE smallest radio tube ever made proved successful in producing the shortest wave length yet to be reached. The tiny tube, with a plate diameter of but 2 mm. was built by Chao-Ying Meng, Chinese research student at the California Institute of Technology. The shortest wave length generated is about one centimeter. A retarding field method is used.

Tractor Fires Fuel Oil With Spark

DIESEL fuel, injected under pressure and ignited with a spark is the secret behind the economical, powerful performance of the new Allis-Chalmers general utility tractor. A Diesel pump is used in injecting the fuel oil, after gasoline has been used in starting.

The new tractor has six speeds forward, ranging from 2 miles to 6½ miles per hour. It develops 79 drawbar horsepower, although its weight is but 23,000 pounds. Spark ignition permits a low-compression type engine, making for greater economy of operation.

This new tractor, delivering 79 drawbar horsepower, burns Diesel fuel injected with a Diesel pump and spark ignited. It has a low compression type motor, started with gasoline.

Science Vies

SCIENCE vies with sport this summer at the Olympic Games in Berlin. The host nation is taking advantage of the ancient games to display Germany's advances to competitors and visitors from all parts of the world.

A $900,000 television system, 14 trucks carrying transmitting equipment to various sports centers, will bring visual broadcasts of the events to that portion of the 500,000 visitors unable to crowd into the array of new sports field about Berlin. It will be the first visual screening of the great open air sports event.

Berlin has not only constructed the great Reich Sports Field five miles from the heart of the city but has rebuilt much of the German capital in preparation for contests in which nearly 5,000 men and women will compete under the colors of 52 nations.

A 24-acre assembly field, scene of the opening ceremony, has been provided to accommodate 400,000 spectators and contestants. At one side is the Fuehrerturm, the 200-foot Leader's Tower, from which the Olympic bell rings. The bell, made especially for the games, is 16 feet high and weighs 10 tons.

The stadium proper is only slightly smaller than that at Los Angeles and will accommodate between 100,000 and 125,000 persons. Elevators have been installed to the upper tiers. An underground radio station will have connections with 30 stations

German Railroads Photo

The main entrance to the Olympic Stadium, reached from the city via Adolf Hitler Place, is pictured above. Glenn Cunningham, one of America's hopes in the events, is shown at the right. A portable German wirephoto transmitter is shown below.

Berlin's newest television station is shown at the lower left. The film projector and picture scanner is in the rear. A new electric timing device for Olympic boxing preliminaries is shown at the right below. It registers the three-minute rounds, sounds the bell 10 seconds prior to the start of each round and counts the seconds when a boxer is floored. In the latter case, a mechanical speaker also gives a verbal count.

With Sport at Olympics

and networks in all parts of the world. A staff of 400 engineers has been employed.

Contestants live in the Olympic Village, nine miles from the field and a city itself. A swamp was drained to provide the site. It contains a bank, a post office, and scores of one-story stone houses, each named for a German city and containing 10 or 12 double rooms for athletes.

Preparations for the field gave employment to 1,000 workers and additional thousands labored on improvements rushed to completion elsewhere in Berlin for the event. These included a new crosstown subway with a special station for the games. A special railroad station was built and the city studded with information booths.

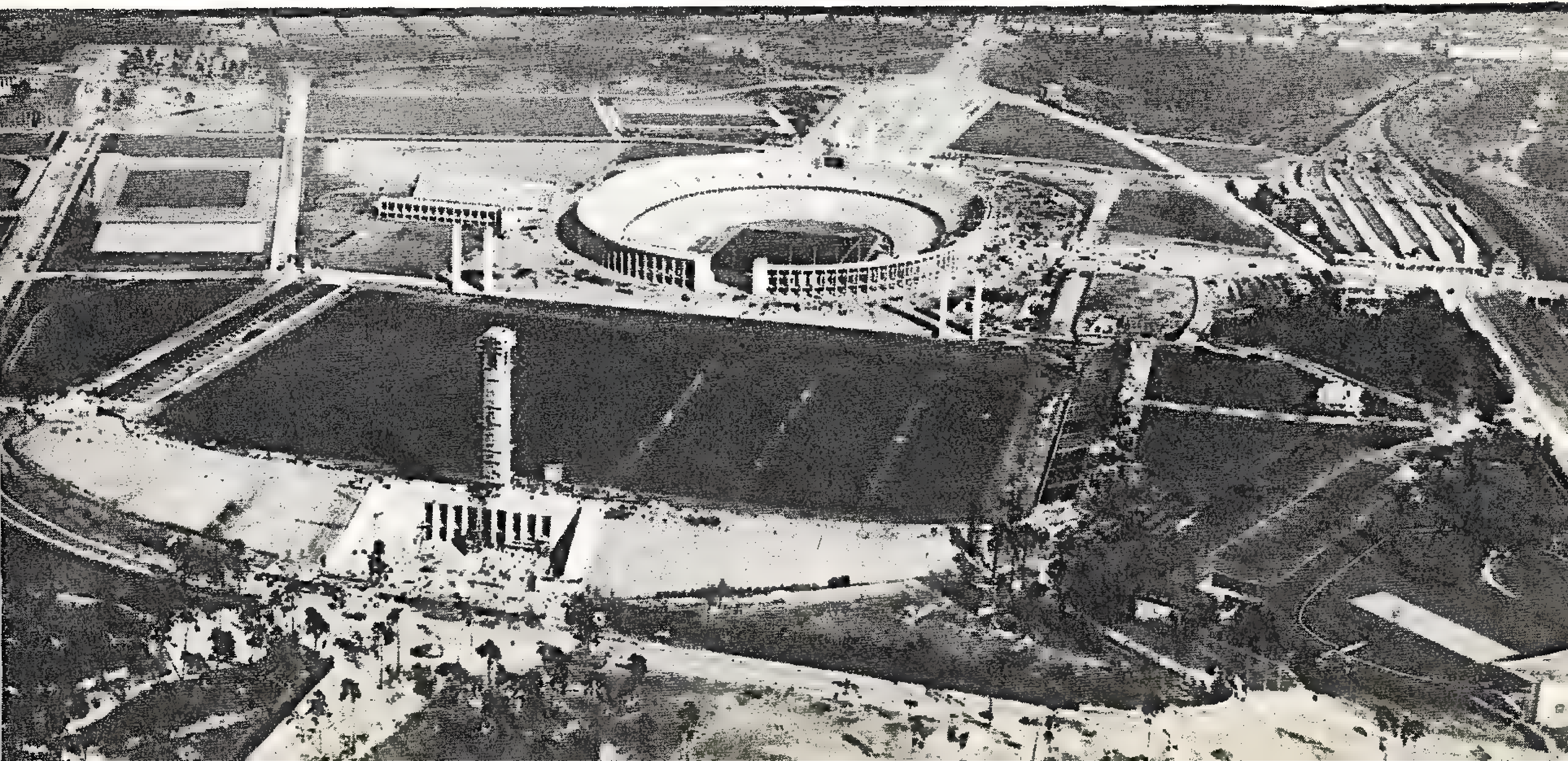
The sports area with the auxiliary swimming stadium, open air Greek Theater and other features, occupies 225 acres on the edge of the Gruenewald at the western side of the city. Parking space is provided for 10,000 automobiles in a single field.

Germany leads in the number of contestants with a team of 448. The United States is second with an aggregation of 395. Japan which hopes to hold the 1940 Games is represented by a total of 337 athletes, trainers and officials. The team is the largest ever entered by the nation in international competition.

Several new hotels have been built and many old ones rebuilt to provide 100,000 additional beds for visitors. Unlike the Los Angeles Olympic quarters of 1932, those in Berlin are of permanent construction.

A general aerial view of the Olympic Stadium and fields is shown below. The 10-ton bell, pictured at top right, hangs in the tower in the foreground. There are tunnel entrances to the great Sports Field adjoining and to the stadium in the background. The Olympic station of the German Railroads can be seen at the right. German girl gymnasts are shown above.

German Railroads Photo



Radio Tower Built Of Wood Improves Program Reception

AMERICA'S first wooden radio tower, 326 feet high, has been built for Larus and Brother, Inc., of Richmond, Va., manufacturers of Edgeworth Tobacco and owners of station WRVA.

Wood, being a non-conductor of electricity, has long been recognized as the ideal transmission tower material, but the number of braces and cross-braces necessary for a high tower has made such construction impractical. The WRVA tower, however, uses a new type of wood connector developed in Germany to eliminate most of the cumbersome cross-braces required for standard construction. These connectors consist of metal rings, saw-toothed on each edge, which are slipped between adjoining timbers to form a joint which bites into both surfaces with an iron grip.

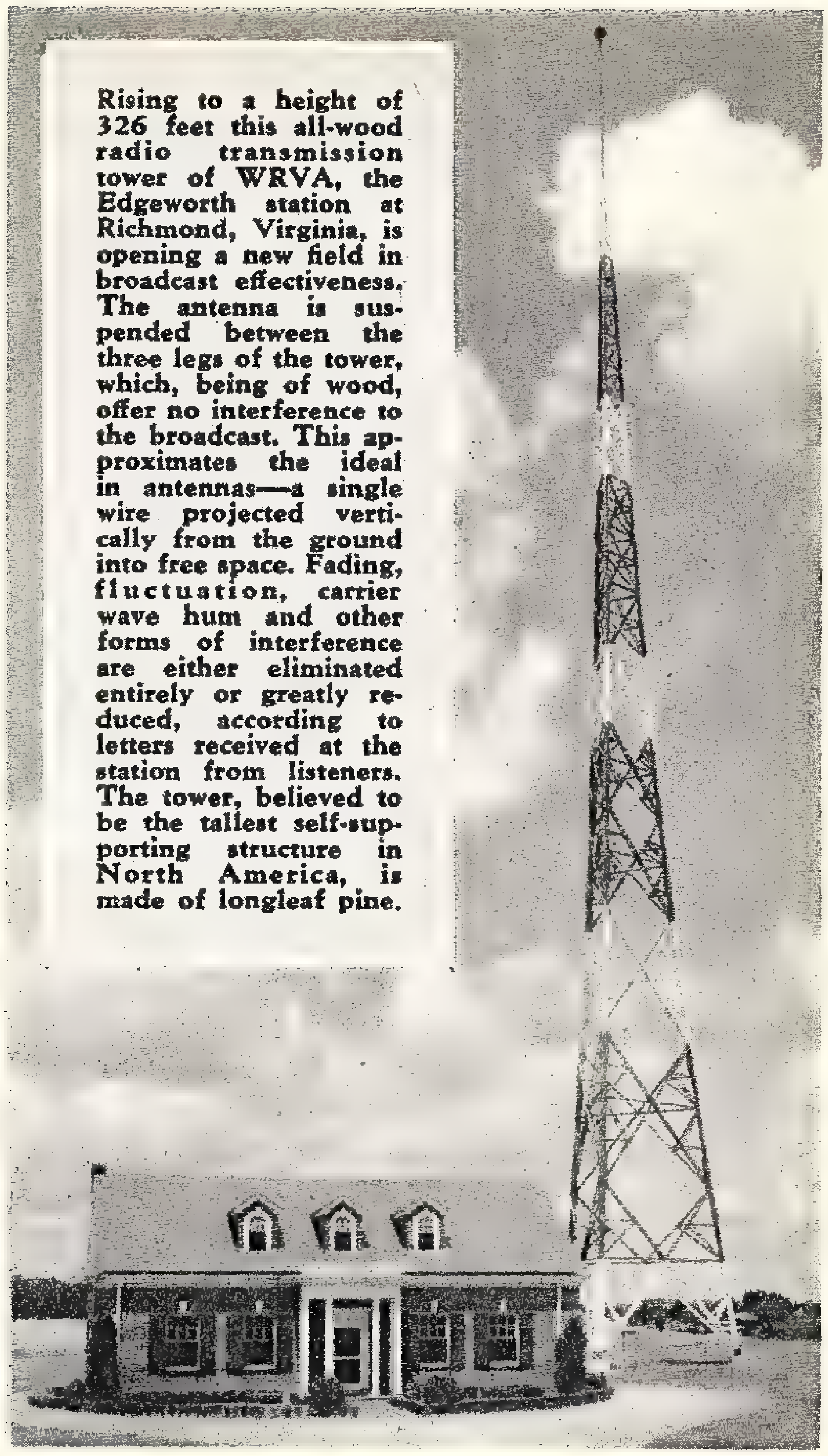
The antenna is suspended vertically between the three legs of the tower, creating the effect of a single wire antenna standing erect in free space. Fading is thereby reduced at all distances, and entirely eliminated in certain zones.

The tripod style of construction, offering only three surfaces to the wind instead of four, insures greater resistance to violent storms. Each foot rests upon a 36½-ton block of concrete imbedded nine feet below the surface of the ground.

Another big factor in the use of a wood tower is the controllability of current distribution in the wire antenna, permitting loading coils and condensers to be placed at any point where they will be most effective. Changes of frequency can be made easily should such a step become necessary.

There is no power loss through absorption of current as is experienced with a metal tower. Neither are there guy wires to further contribute to the loss. The result is practically a circle coverage, all receiving sets in the same radius from the tower receiving the same volume. This means a reduced load for the station, as the power does not have to be stepped up to overcome losses. Dead spots in the station's primary area are eliminated.

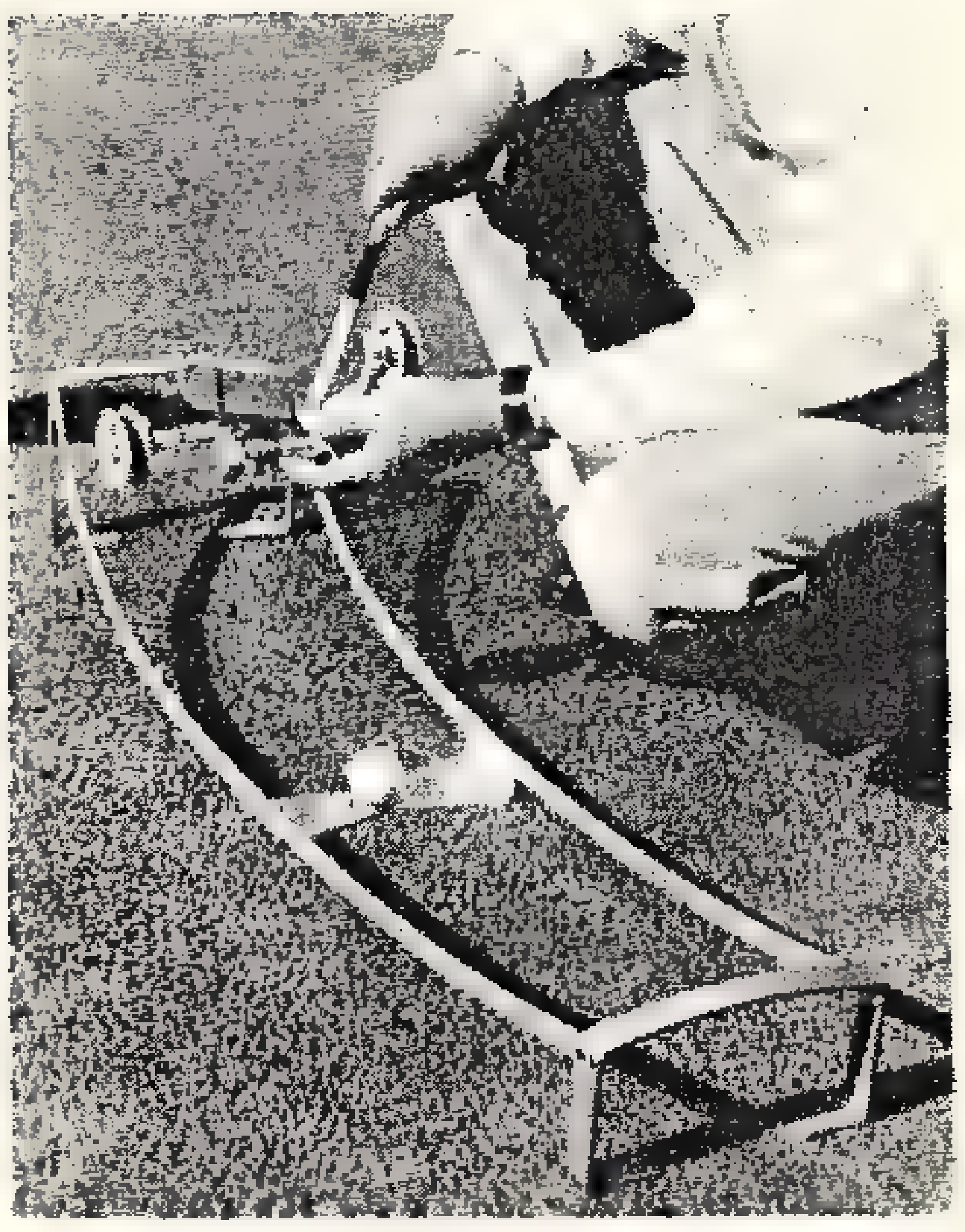
Field test show that the new antenna has increased the area served by the station by 400 per cent, while thousands of letters from listeners attest to reception improvement. WRVA operates on a frequency of 1,110 kilocycles.



Rising to a height of 326 feet this all-wood radio transmission tower of WRVA, the Edgeworth station at Richmond, Virginia, is opening a new field in broadcast effectiveness. The antenna is suspended between the three legs of the tower, which, being of wood, offer no interference to the broadcast. This approximates the ideal in antennas—a single wire projected vertically from the ground into free space. Fading, fluctuation, carrier wave hum and other forms of interference are either eliminated entirely or greatly reduced, according to letters received at the station from listeners. The tower, believed to be the tallest self-supporting structure in North America, is made of longleaf pine.

Putting Machine Improves Stroke

A RECENT invention designed to improve a golfer's putting ability will be placed on the market in the near future. The device consists of two track in which run three rubber tired wheels that support the golf club. After lining up the machine about five feet from the cup, the ball is placed on the bridge, and the golfer makes his regular putting movement. The rails serve to guide his stroke in the correct arc until it becomes a habit.



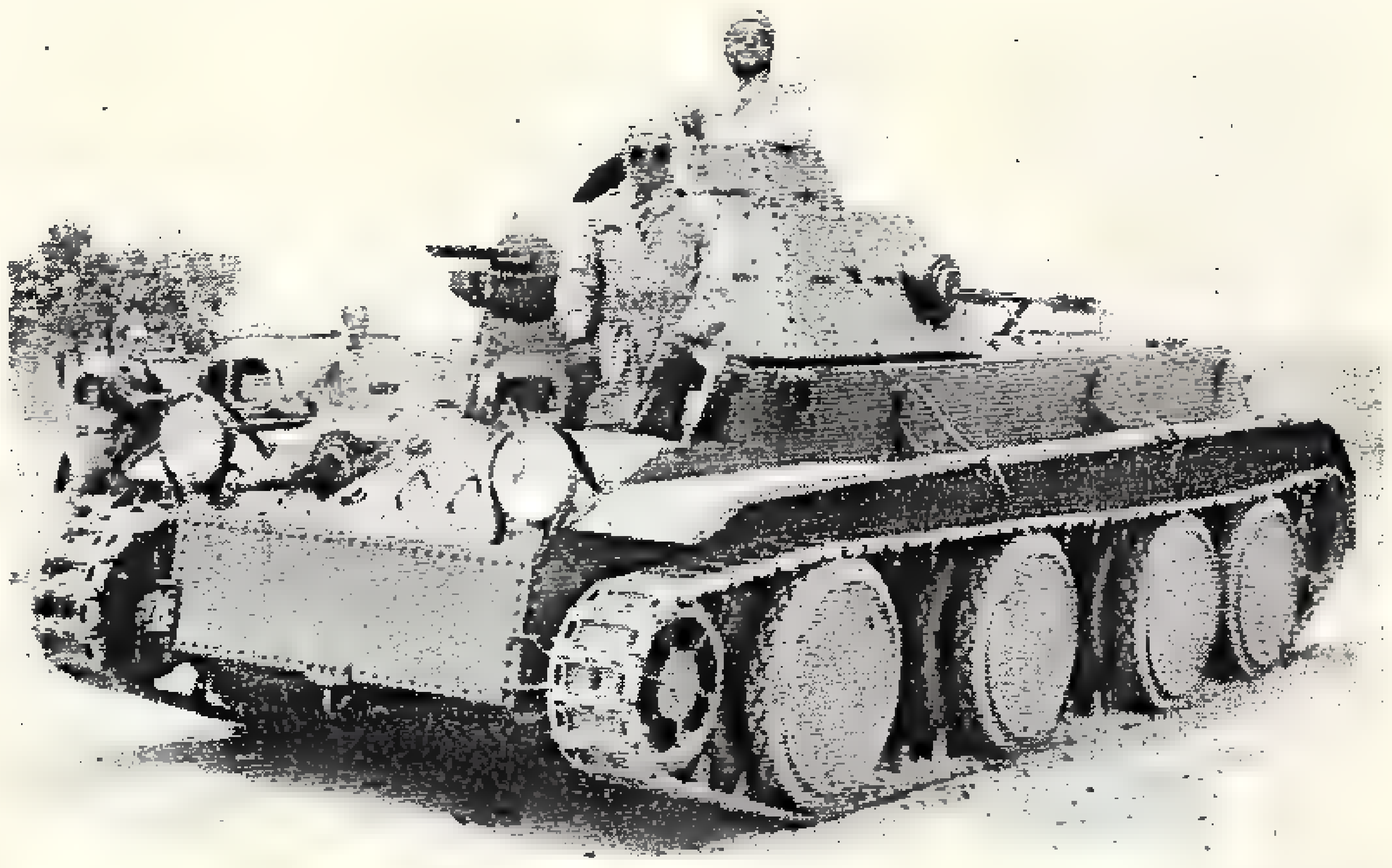
This new putting machine guides the golfer's stroke in the correct channel until it becomes a habit.

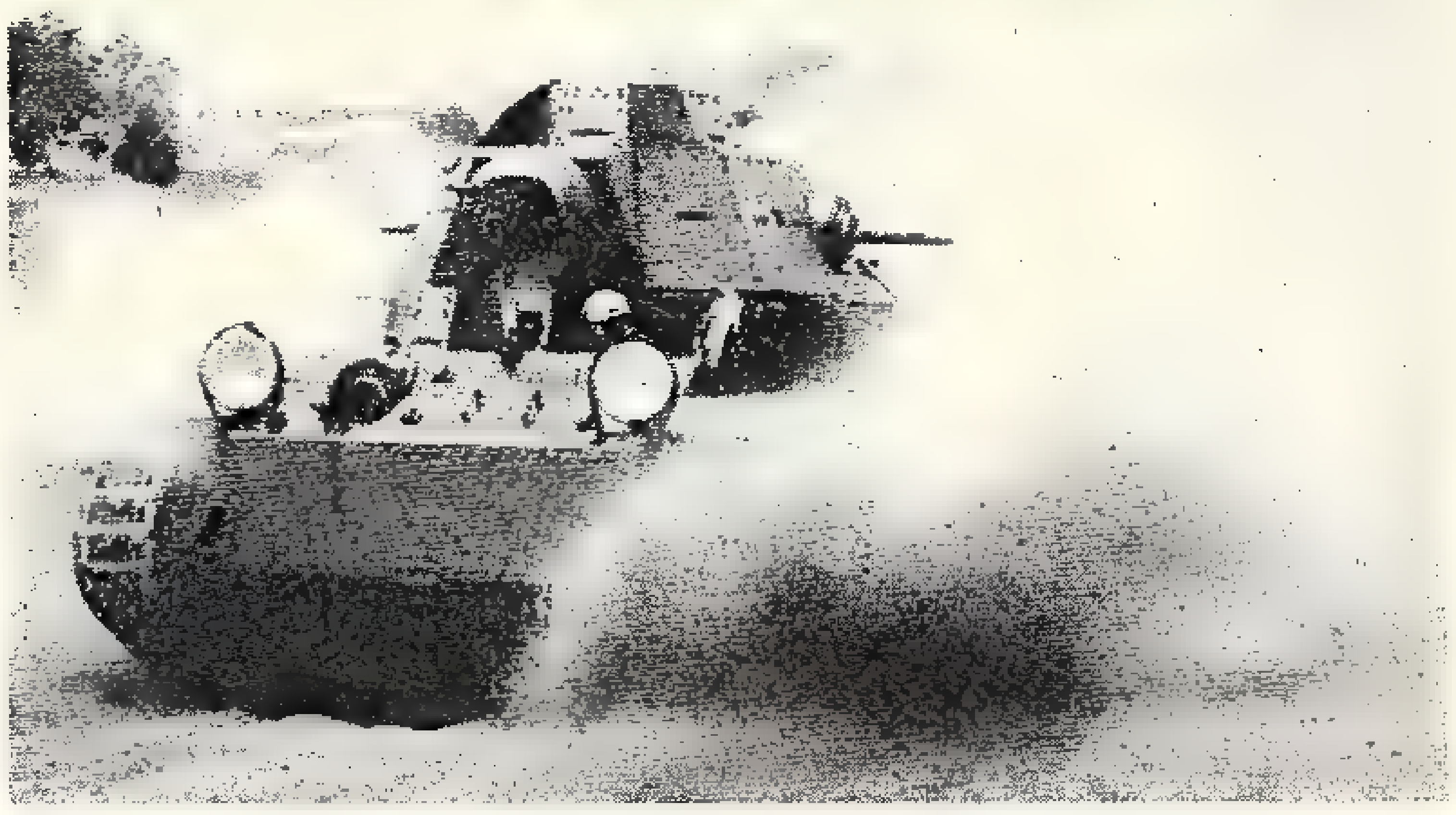
13-Ton Army Tanks Crush Obstacles At 70 Miles Per Hour

TANKS, built like forts, equipped like battleships, and as fast as automobiles, are the latest addition to the United States Army. The steel monsters weigh 13 tons and have a top speed of 70 miles per hour when stripped of the caterpillar treads.

Before being accepted by the army the tanks were subjected to rigid tests in sand pits, mud lakes, dense underbrush and steep hills. In all they proved themselves the most efficient fighting machines yet developed.

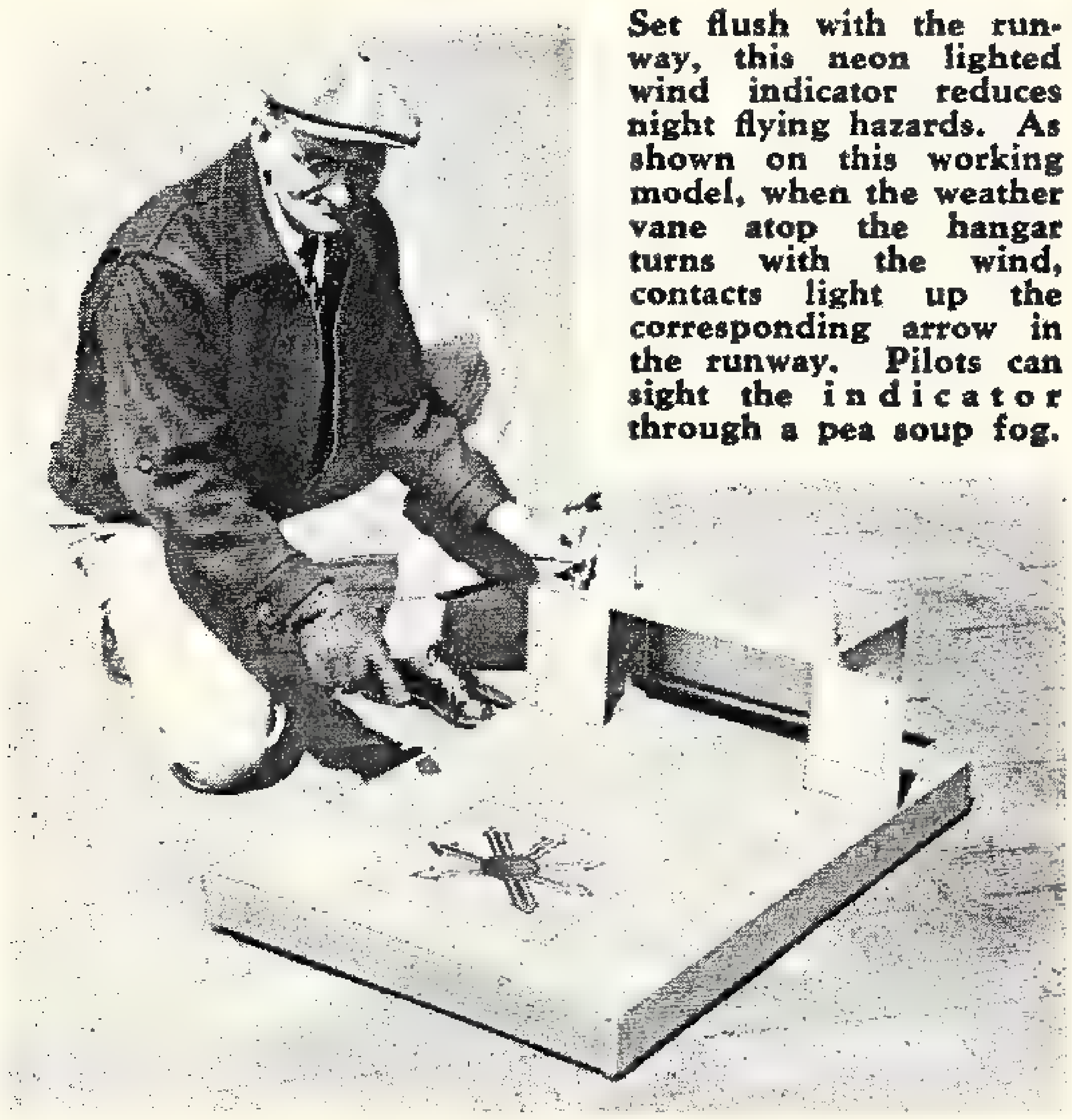
Equipment consists of one 37 m.m. gun, four 30 caliber machine guns, and a radio for contacting headquarters. Quarters are furnished for a crew of four, with plenty of room left over for ammunition lockers and a fuel supply sufficient for a cruising radius of 200 miles. In rough going caterpillar treads are used, reducing the speed to approximately 30 miles per hour.





Top—The latest in Uncle Sam's fighting machinery. This tank, carrying four machine guns, one 37 m.m. gun and crew of four, has a top speed of 70 m.p.h. without caterpillar treads. Below—Plowing through a sand pit at 30 m.p.h.

Wind Marker Flush With Runway



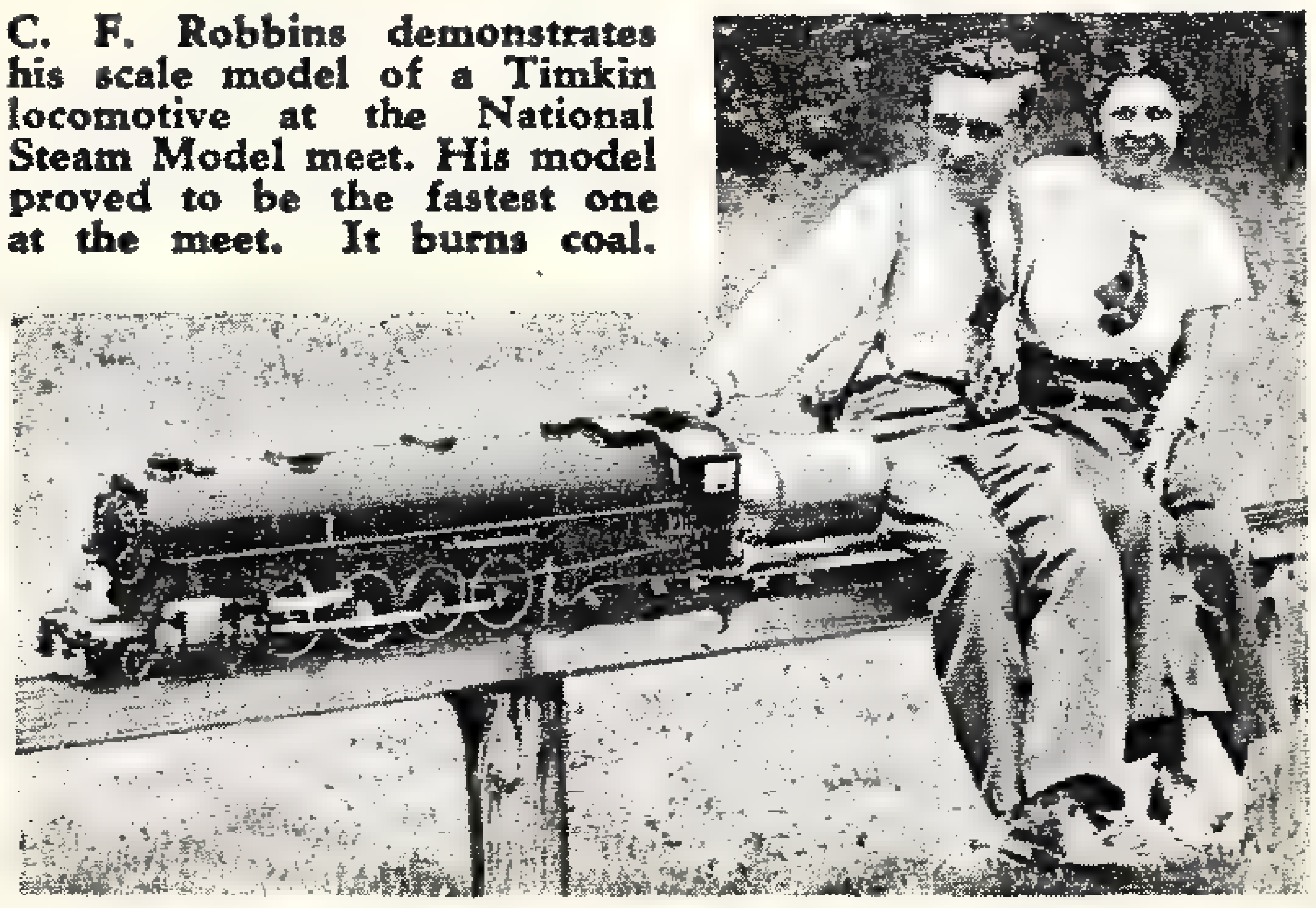
Set flush with the runway, this neon lighted wind indicator reduces night flying hazards. As shown on this working model, when the weather vane atop the hangar turns with the wind, contacts light up the corresponding arrow in the runway. Pilots can sight the indicator through a pea soup fog.

A NEON lighted wind indicator, designed to eliminate night landing hazards at airports, has been perfected by Albert de Weerd of Roosevelt, New York. Contact points on a remote weather vane serve to illuminate the arrows of the giant indicator according to the wind changes. The red light of the neon tubes penetrates fog, giving high visibility. Because the indicator is set flush with the flying field, the tubes being protected by heavy glass, the pilot can land directly upon it, saving hazardous guess work.

Model Locomotive Wins Honors

AN EXACT scale model of a Timkin locomotive, built by C. F. Robbins of Keene, N. H., proved the fastest model entered in the National Steam Model Meet held recently at Oxford, Maine. Model locomotives from all over the country were entered in the meet.

Even the steam plant of Robbins' model functions as does the giant engine from which it was patterned. Soft coal is used for fuel to power the eight drive wheels. It hauled two passengers around the thousand-foot track with ease.



C. F. Robbins demonstrates his scale model of a Timkin locomotive at the National Steam Model meet. His model proved to be the fastest one at the meet. It burns coal.

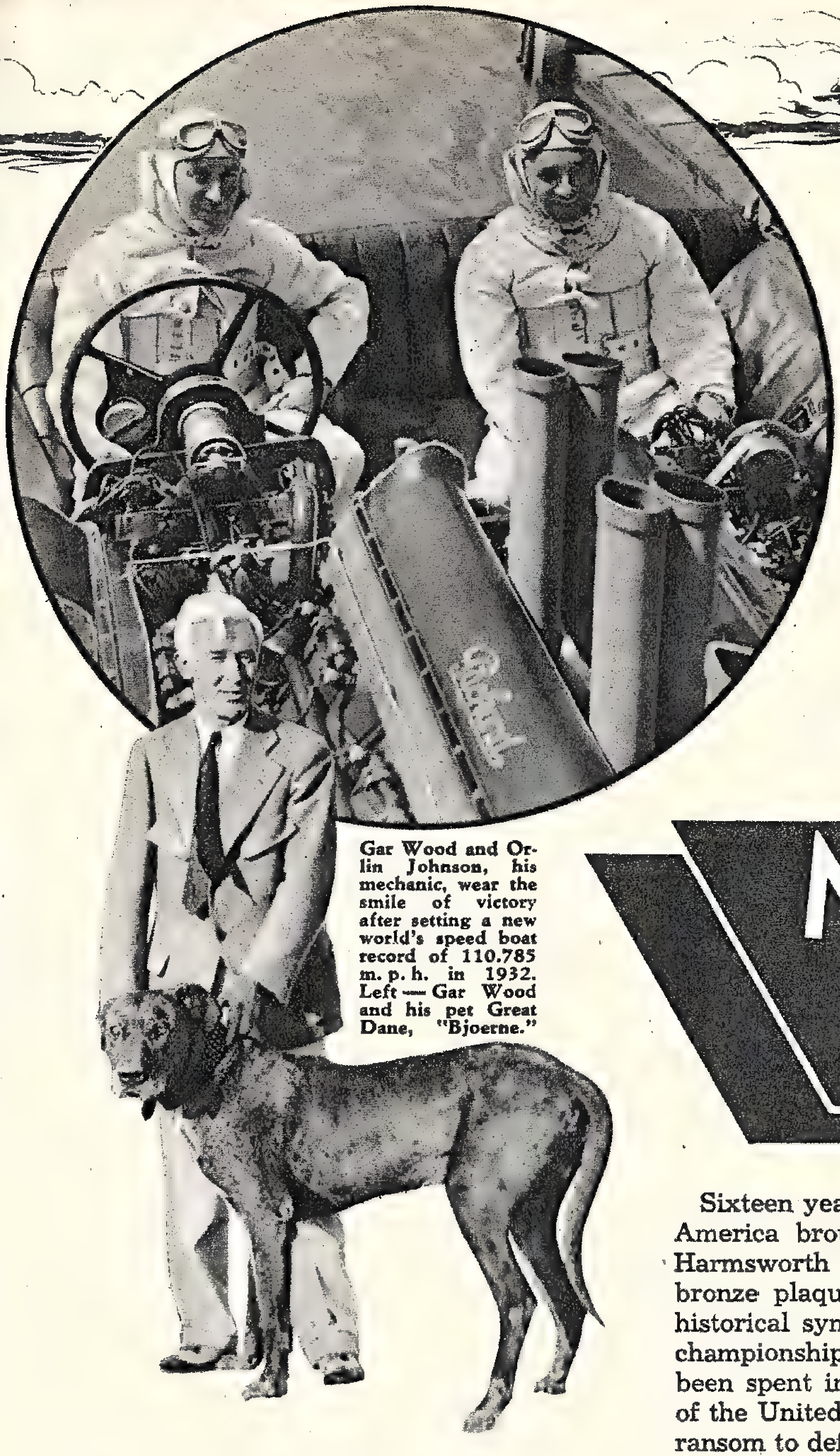
MISS AMERICA X

Making Go

By Gar Wood

as told to PAUL WEBER

When water becomes as hard as marble, and waves rip vanadium steel bolts from the hull as though they were copper rivets—that's speed! America's premier boat racer takes you into the cockpit of Miss America X and shows you what it is like in this article.



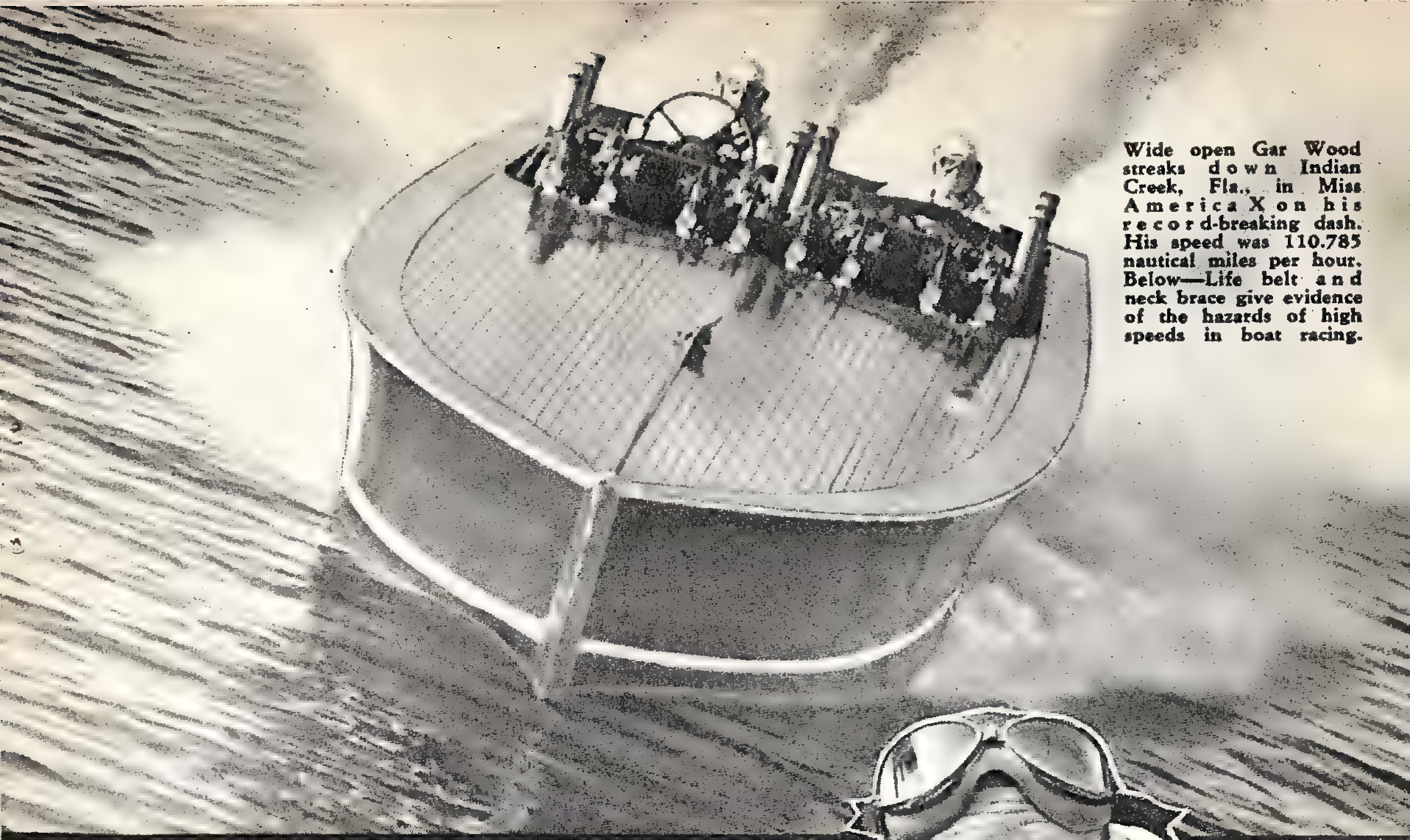
Gar Wood and Orlin Johnson, his mechanic, wear the smile of victory after setting a new world's speed boat record of 110.785 m. p. h. in 1932. Left — Gar Wood and his pet Great Dane, "Bjoerne."

FOR a quarter of a century it has been my pleasure and pride to act as America's self-appointed champion in the rivalry among nations for speed supremacy on water.

I have been privileged to travel faster in an American-made boat, powered by American-built motors, than man has ever traveled on water before. Twenty-six years ago, I set my first world speedboat record, at the dizzy pace of 30 miles per hour. Today, my Miss America X holds the world record of 124.91 statute miles per hour.

Sixteen years ago at Cowes, England, Miss America brought to the United States the Harmsworth Trophy. In itself, this small bronze plaque is worth little. But, as the historical symbol of world motorboat racing championship, it is priceless. Millions have been spent in efforts to take the trophy out of the United States. It has cost me a king's ransom to defend it. But, thanks to luck and American engineering skill, I have been able to defend it successfully. Since the victory at Cowes, it has reposed without interruption in its place of honor at the Detroit Yacht Club. It does not belong to the Yacht Club, nor to me. It belongs—for a time, at least—to America.

These 26 years of experiment and struggle, have been a great adventure. I look backward with pleasure. But looking backward does not suffice; I am required also to look forward. Just how long I expect to be able to continue holding water speed honors in the United States is a question that I am often



Wide open Gar Wood streaks down Indian Creek, Fla., in Miss America X on his record-breaking dash. His speed was 110.785 nautical miles per hour. Below—Life belt and neck brace give evidence of the hazards of high speeds in boat racing.

Boats FASTER

asked. Is the practical limit of speed on water approaching? Is it possible to go on indefinitely adding miles to that mark of 124.91 M. P. H.?

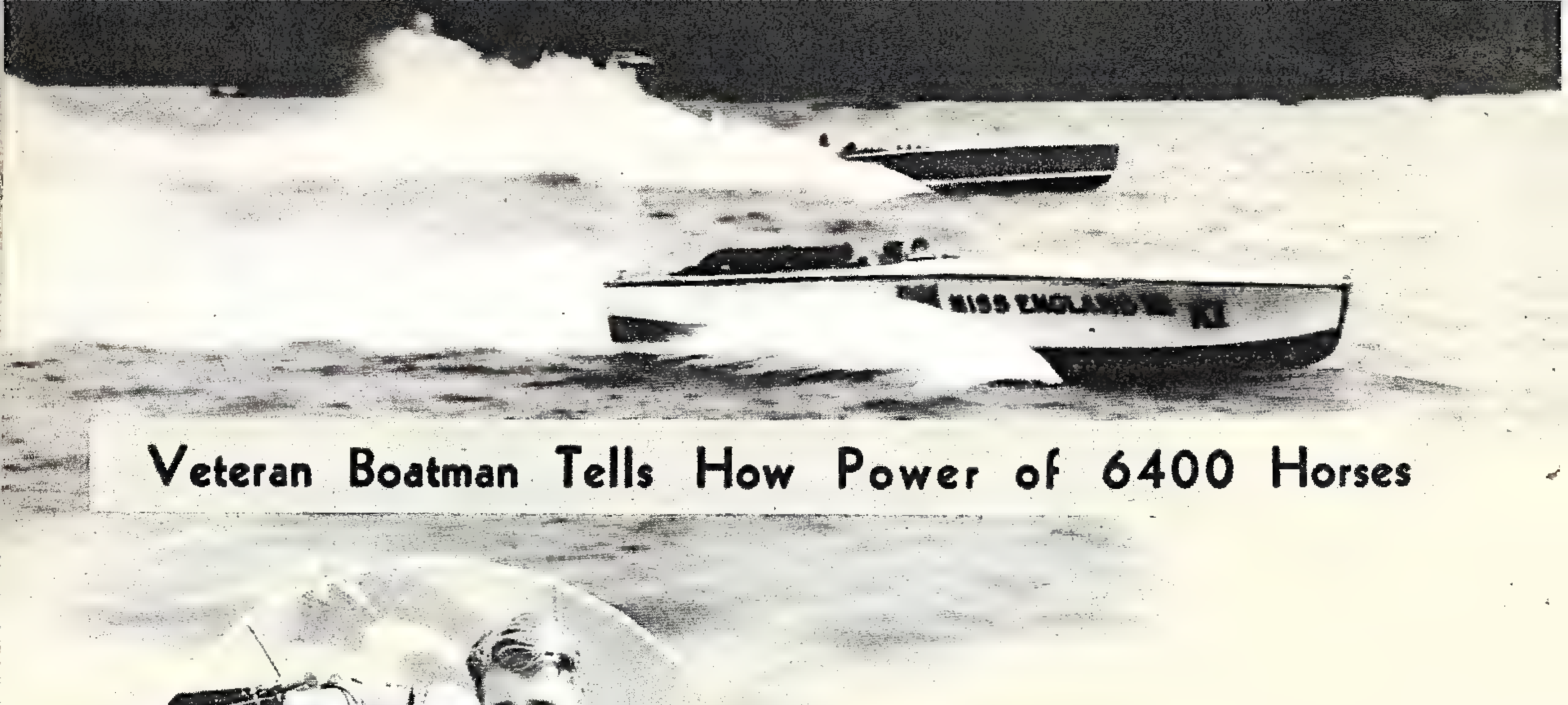
I should like to be able to make some satisfying reply to these questions. But I have no idea what the "practical limit" of water speed may be, if, indeed, there is such a thing. I feel sure that 150 M. P. H. is well within the possibilities of boats of present basic design. How far beyond that we can go without some radical change, particularly in power plants, it is not within my power to prophesy.

One thing definite is that the battle for speed honors has become a battle for more power in motors. Give me a 3,500-horsepower motor and the world will see a "new deal" in speed on water. But you could not buy such a motor in America today for its weight in government bonds.

A 3,500-horsepower motor is not an impossibility. However, before we go into the reasons why such motors are not made in this country, let us consider the two things that produce speed in a boat like the Miss America X. These two factors are *power* and *planing ability*.

Boats of the Miss America type are known as hydroplanes, which means "water planes." The hydroplane does not plow through the

Veteran Boatman Tells How Power of 6400 Horses



Miss America Tenth, in the background, pulls up to pass Miss England III in the Harmsworth Trophy race. Gar Wood piloted Miss America, and Kaye Don piloted Miss England. Wood won.

In his father's footsteps. Gar Wood, Jr., poses for cameramen after setting two records in Class A and C events at the National Motor Boat Sweepstakes.

water like an ocean liner or a pleasure yacht. It skims over the surface when going at high speed, and the hull rides almost entirely out of the water. This "planing" is caused by the lifting power of the plane surfaces which make up the bottom of the boat's hull. It is extremely important that these planing surfaces are set at the proper angle in relation to each other to bring about the proper lift. On the Miss Americas we have always used only two planing surfaces. On their relative positions depends her maneuverability, speed and, in fact, her actual existence.

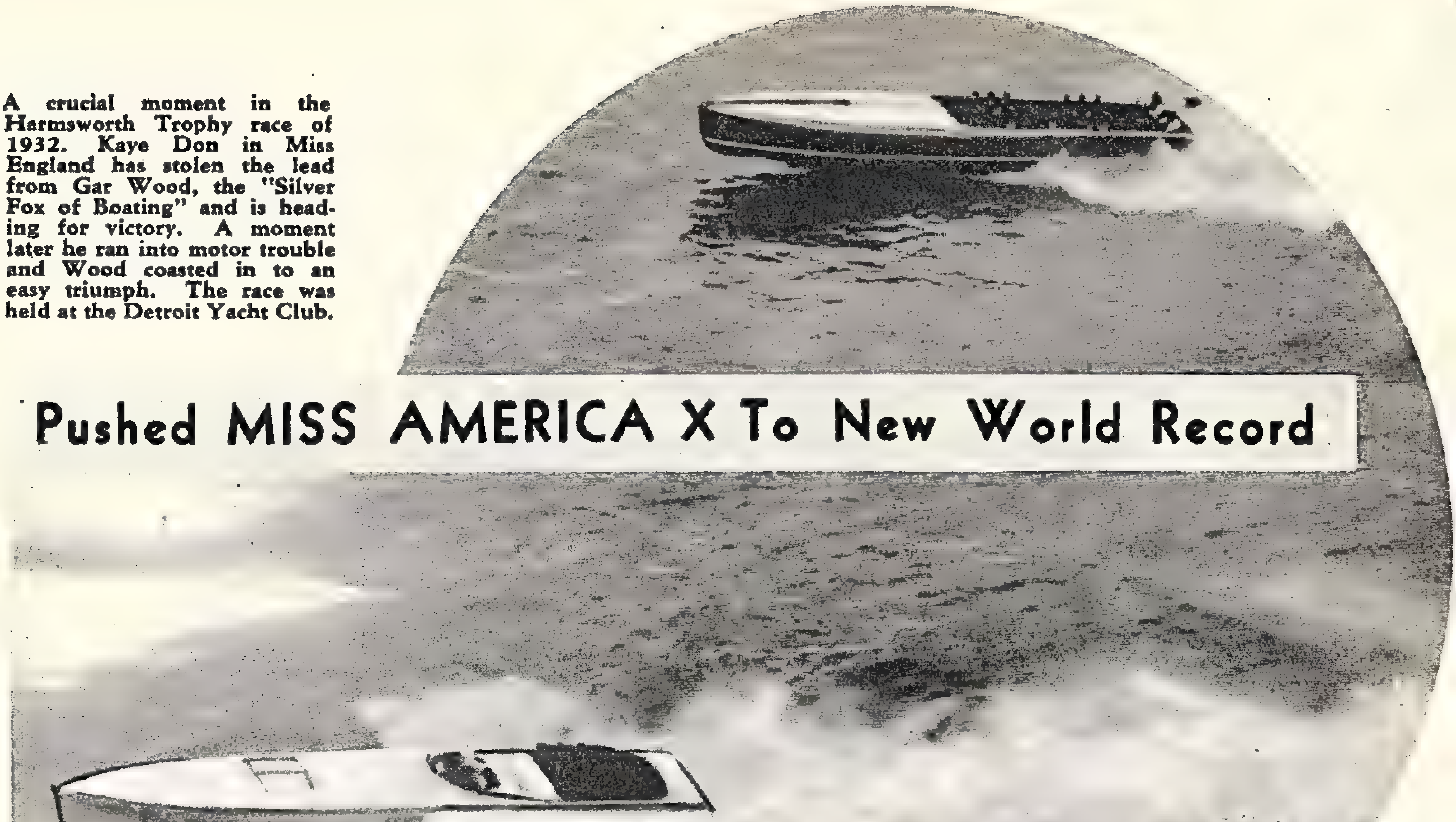
The sharp break in a hydroplane's hull where the forward planing surface ends and the aft planing surface begins, is called the "step." The forces effective on the planing surface ahead of the step are unbelievable. The planks on the bottom of Miss America X are bolted to the hull timbers with bolts of vanadium steel, heat treated for the utmost strength. Yet we sometimes find them wrenched loose, as though the water had gigantic fingers.

When Sir Henry Seagrave, of heroic memory, was killed at Lake Windermere in England, in 1930, it was stated that his Miss England hit a floating log. In my opinion, what really happened, was this: Sir Henry was experimenting with the location of his "step," to make his boat plane properly. He had not been able to figure it out mathematically or from experience. So he fastened a makeshift temporary "step" on the bottom of his boat, with the idea of changing its position to suit conditions.

He was wrong. It proved not strong enough. The water's pressure tore part of the "step" out of the Miss England. The boat overturned and Sir Henry was crushed to death. He was a great sportsman and a hardy competitor. His death was a tremendous loss to England and the whole world of sport.

Through continued experiments and the construction of the successive Miss Americas, we have assembled a treasury of information about what takes place in that small area—hardly larger than a kitchen table top—where the speeding hydroplane rests on the water. We feel that American engineers now know at least as much about this factor in building super-speed boats as any other engineers in the world. Although there is much still to be learned in this field, boat design has ceased, at least for the present, to be our major problem.

The second factor in the make-up of a

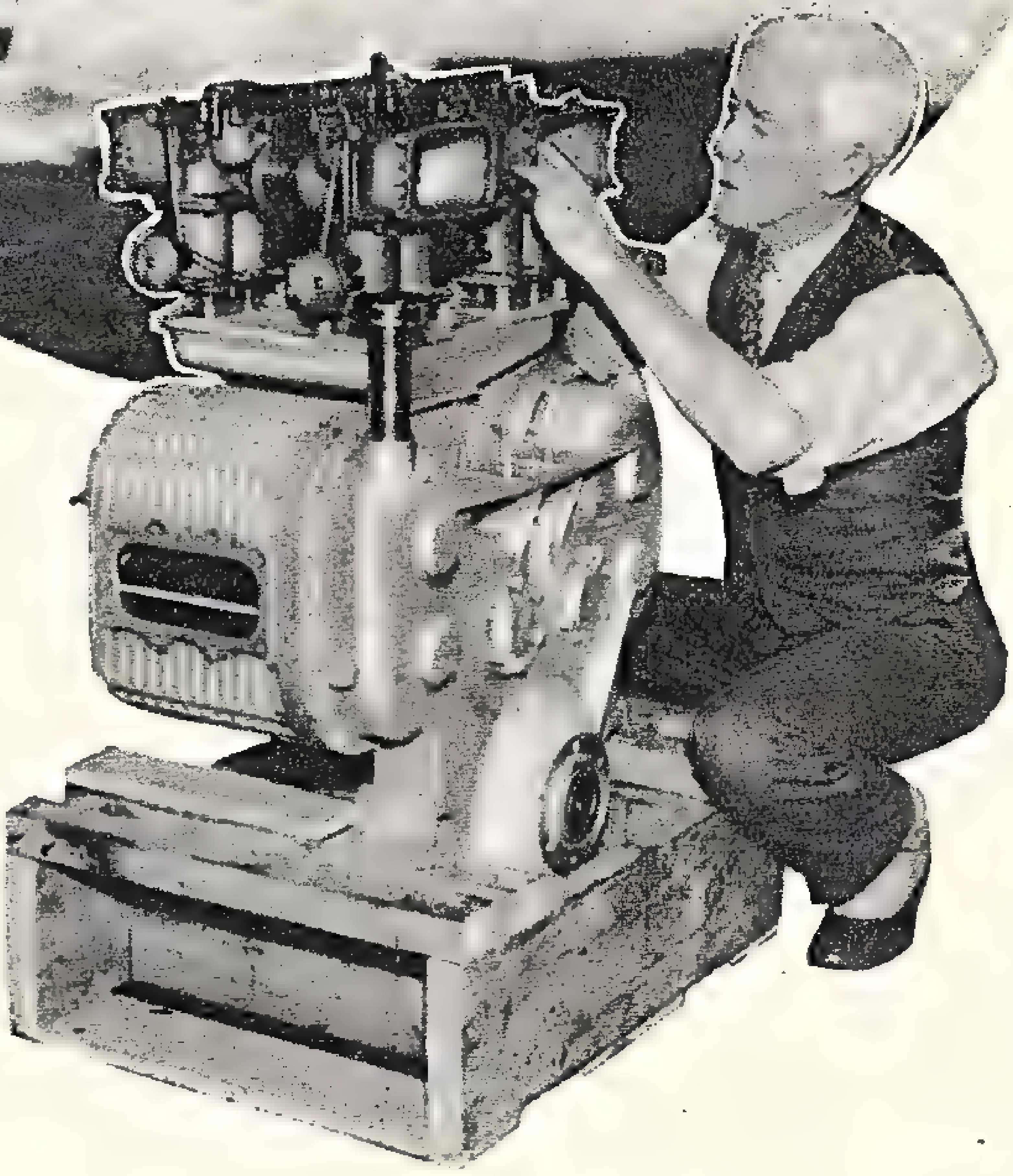


A crucial moment in the Harmsworth Trophy race of 1932. Kaye Don in Miss England has stolen the lead from Gar Wood, the "Silver Fox of Boating" and is heading for victory. A moment later he ran into motor trouble and Wood coasted in to an easy triumph. The race was held at the Detroit Yacht Club.

Pushed MISS AMERICA X To New World Record

hydroplane is power. And that's something else. The engines installed in the Miss America X are four Packard V-twelves, the most powerful gasoline motors in the United States. They are direct descendants of the famous Liberty engine. This motor was designed and developed by Col. Vincent, of Packard Motor Company, and Mr. Hall, of the Hall-Scott Company, and their associates, for American airplanes during the world war. Fundamentally it was as good a motor as had ever been built, and it is still practically as good a motor as can be obtained in the United States today, power for weight, for marine purposes. Of course these Liberties haven't sufficient power for super-speed boats, although they were used in the first five Miss Americas.

The Packards in the Miss America X originally generated 725 horsepower each. By applying superchargers and various experimentations, we have stepped them up to 1,900 h. p. each. This illustrates the possibility of increasing power by persistent effort, and it sounds like a tremendous lot of horsepower. But let's see what sort of power Harmsworth challengers bring against us. When Lord Wakefield sent Kaye Don over to drive his Miss England III in 1932, the Miss England carried two Rolls Royce motors capable of developing nearly 2,500 h. p. each—a total of 5,000 h. p. against the 3,000 we could develop with two Packards in Miss America IX.



Gar Wood is now searching for the 3500 horsepower motor, light enough for a speed boat. He is convinced that speed boat supremacy rests not in boats and men, but super-motors.

To be sure of enough power to drive the Miss America X to victory we decided to use four motors against Don's two, regardless of additional weight. In other words, pounds for horsepower, the British challenger was far better equipped than we were. Miss America X's weight was approximately ten

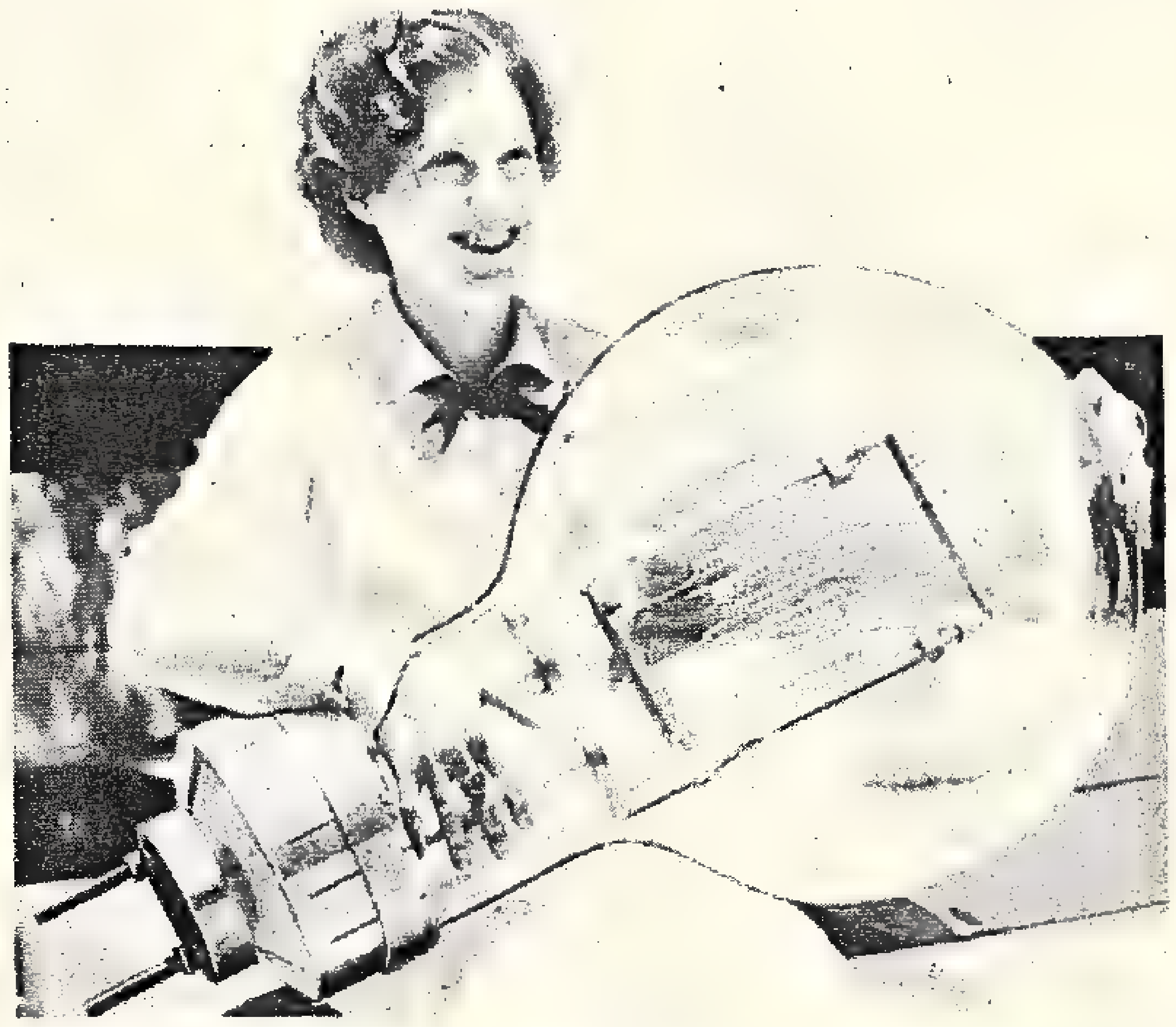
[*Continued on page* 135]

The latest surprise in store for us comes from Austria. It is synthetic coffee, called "Syngala 761." Pictures show the inventor and the processed coffee cubes.

50,000 Watts In Giant Light Bulb

ELECTRIC light bulbs come in all shapes and sizes, but never before has there been one so big as the giant bulb now on display at the California-Pacific International Exposition in San Diego. It is the world's largest and weighs 70 pounds.

But soon it will be removed and put on the job for which it was made—airport flood lighting. The bulb has a capacity of 50,000 watts and will burn steadily for 120 hours. It required a month to make and cost $600.



Miss June Bishop is holding the world's largest electric light bulb in her lap. This is the six-hundred-dollar, 50,000 watt bulb which is to later light one of our airports.

Austrian Chemist Makes Synthetic Coffee

THE accidental triumph of an Austrian bio-chemist, Magister S. Rosenzweig, has resulted in synthetic coffee. Last summer the fruit produced by the grafted bushes on Rosenzweig's Viennese farm was found to have the aroma and taste of Brazilian coffee, and an additional nutritive value, hitherto unknown in the tropical coffee plant.

The bio-chemist calls it "Syngala 761." Its base consists of dried fruits, seeds and roots. The dried extract is mixed with sugar and compressed into cubes, each cube making a cup of coffee. The cube is porous and easily crushed by the spoon. When hot water or milk is added, the powder dissolves without a trace of sediment. The caffeine content is controlled to the wanted amount.

Pointing like a rifle and having triggers, this portable light throws colored beams for signaling purposes at Logan Field, Baltimore, Md. It replaces the old flagging system.

Three Colors Form Airport Light

WHEN the spring floods came to Logan Field, Baltimore, Md., a portable traffic light was substituted for the old-fashioned flagging system. The light worked so well that it has been kept in continuous use ever since.

It is operated by revolver-like triggers, and the operator can snap on a powerful red, green or white beam. The red and green beams keep airplanes in the air until the field is cleared, the white beam signals "clear."

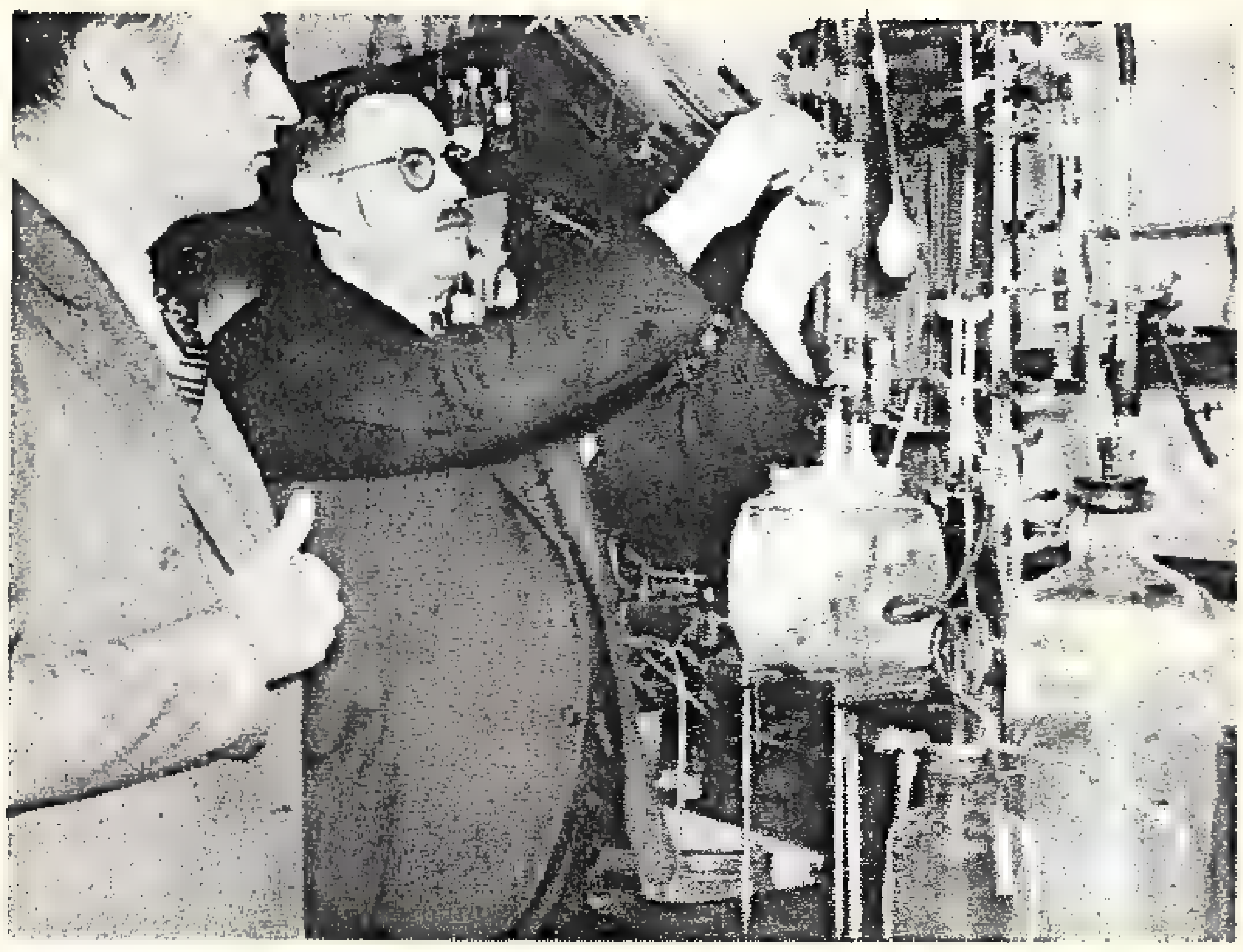
Trocadero Falls To Make Way For 1937 Exposition

HUNDREDS of buildings, many of them ancient landmarks, are being torn down in the heart of Paris to make way for the 150-acre International Exhibition of Art and Technique to open during 1937.

Among the first to fall was the famous Trocadero, built for the exhibition of 1878, and since used as a museum.

In planning this vast exhibition for the world's public, the French were inspired by the example of Chicago, Cleveland and Dallas. Aviation, the radio, television, movies, the victory over space and time, the harmonies of light and sound, the unity of matter and the movement of waves—all these wonders will be on display in the French capital next year.

Blood-Making Bottle Newest Robot

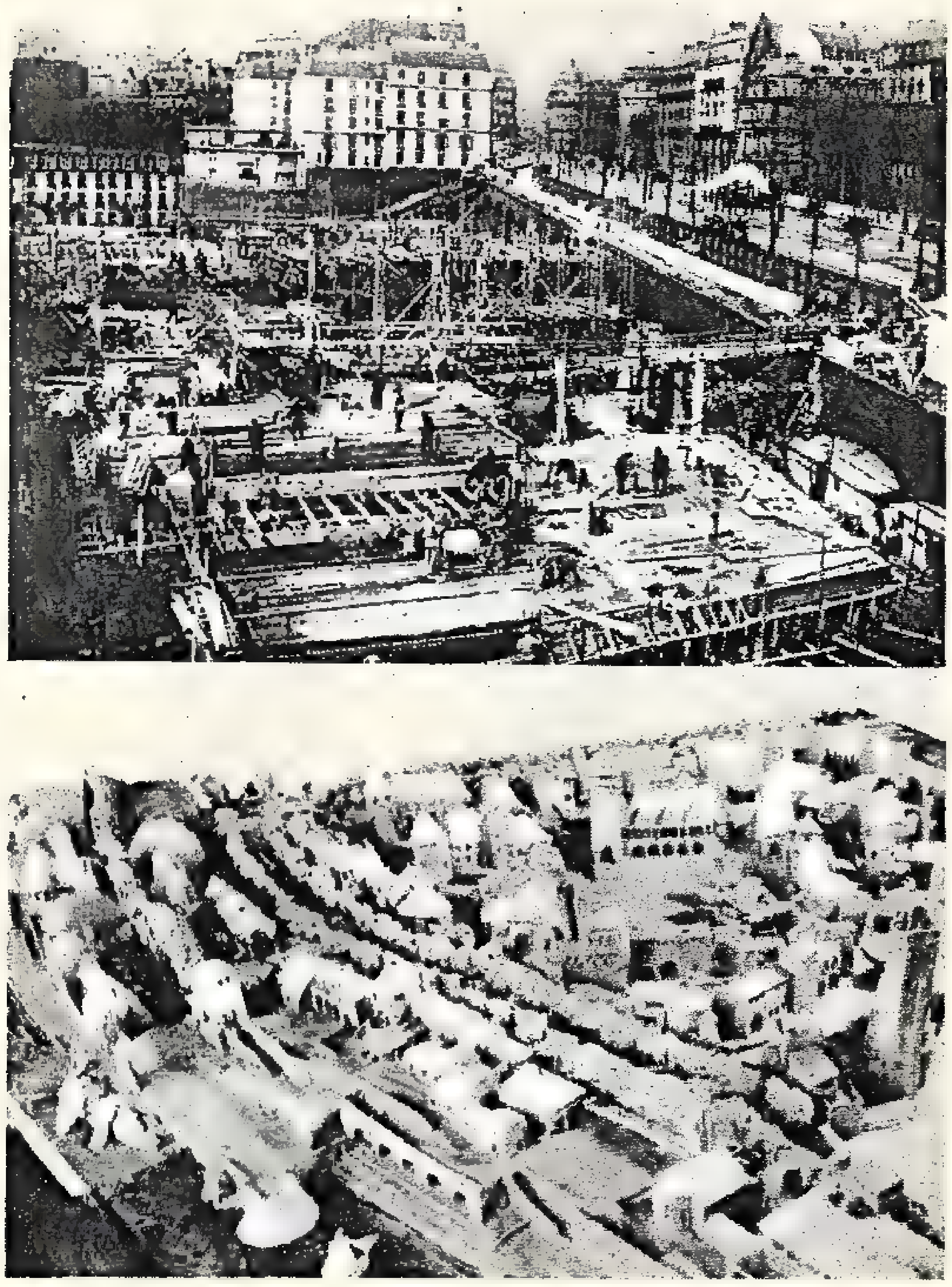


Dr. Edwin E. Osgood (right), and his co-inventor, Alfred N. Muscovitz, with the "blood-making" bottle in their laboratory at the University of Oregon Medical School, Eugene, Oregon.

OF INTENSE interest to the medical world is the new synthetic-life apparatus invented by Drs. Edwin C. Osgood and Alfred N. Muscovitz of the University of Oregon Medical School.

This device is a robot bottle in which one of life's most vital processes, the replenishing of the blood-cell supply by the bone marrow, may be reproduced artificially and viewed for the first time. The bottle will be used in testing serious blood diseases.

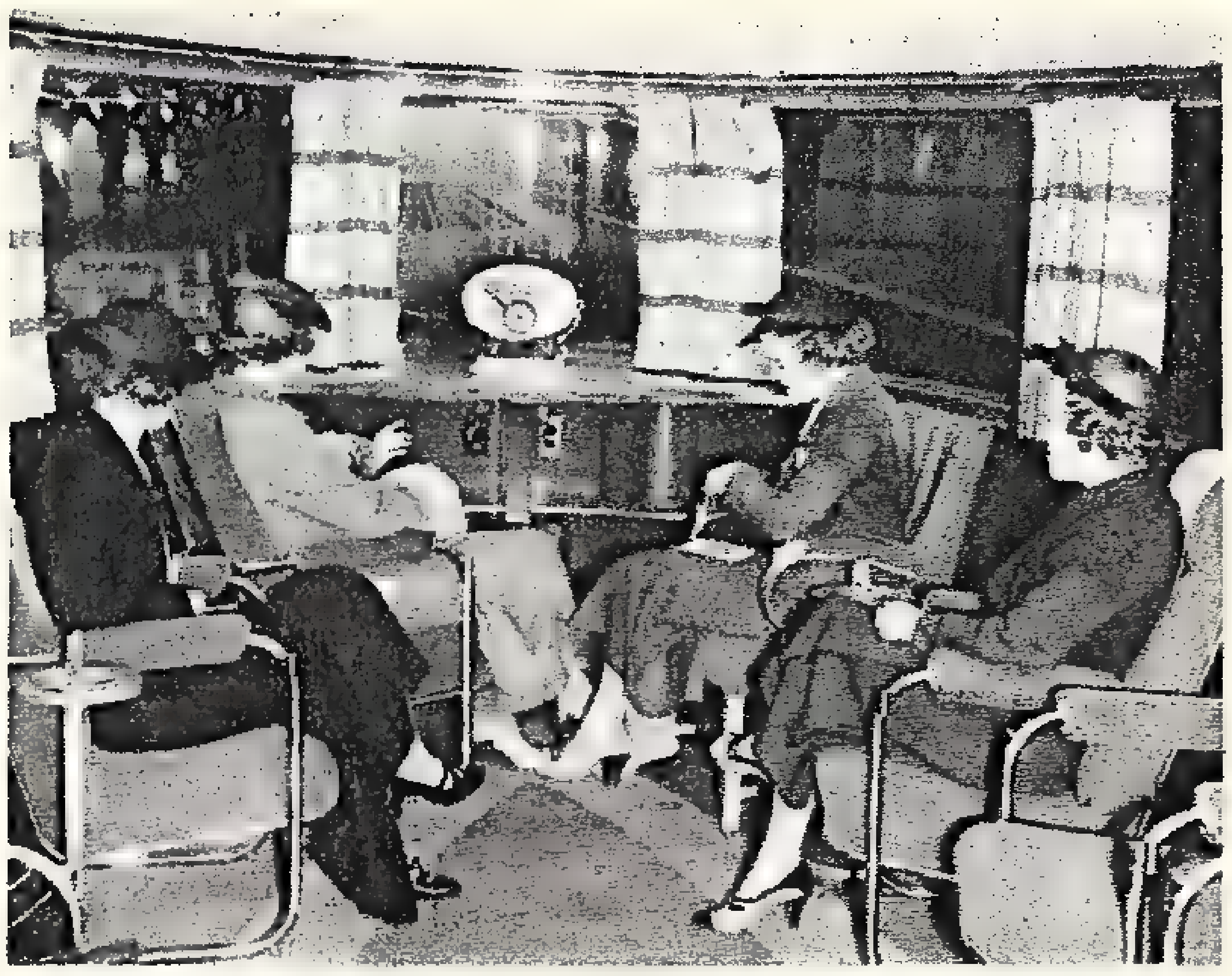
With this "blood-making" bottle and the Lindbergh "life-chamber" working for biological science, who knows but that we may soon have a complete glass robot, in which all the extirpated organs from the human body will live and function under observation.



The sum of the scientific knowledge of today is the aim of the 1937 Paris Exposition, where Science is to be on display. Above—Model of coming exposition and the first excavation.

Speedometer For Train Passengers

THE Boston and Maine Railroad recently installed a speedometer in the solarium of its crack, streamlined Flying Yankee, so that passengers might check their estimates against the actual speed of the train. If the passengers like the device, the B. & M. will install one in each of their de luxe day coaches on express trains. The speedometer was developed by the Waltham Watch Company.

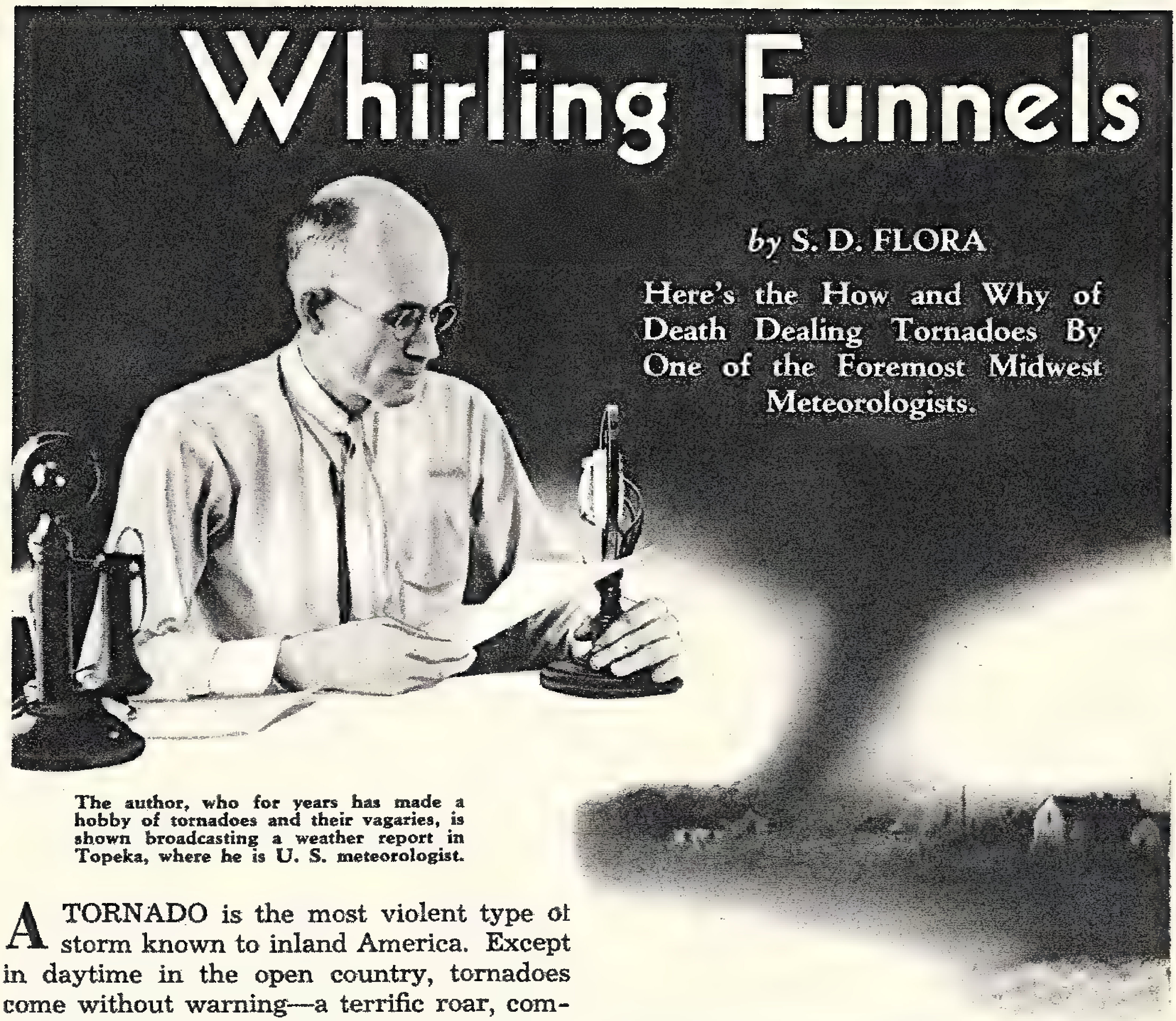


If the speedometer on one of the Boston & Maine Railroad's crack flyers works out satisfactorily and interests passengers, the company will install them on all their express trains.

Whirling Funnels

by S. D. FLORA

Here's the How and Why of Death Dealing Tornadoes By One of the Foremost Midwest Meteorologists.



The author, who for years has made a hobby of tornadoes and their vagaries, is shown broadcasting a weather report in Topeka, where he is U. S. meteorologist.

Terror is the natural reaction when a storm of this kind appears. This tornado swept through the northern suburbs of Wichita, Kansas, on February 24, 1935, injuring six persons and causing $10,000 damage. Two miles farther south, a great disaster would have resulted.

A TORNADO is the most violent type of storm known to inland America. Except in daytime in the open country, tornadoes come without warning—a terrific roar, commonly described as resembling "a thousand freight trains," often a weird whistling sound, and the crash of wreckage, and the storm moves on, leaving a trail of desolation and often death that seems incredible considering that the passage of the storm requires only a few seconds.

In the 20 years ending with 1935, Weather Bureau reports list 2,702 tornadoes, with a death list of 5,258 and a property loss in excess of $225,000,000. The greater number of these storms occurred in the mid-western and southern states, though very few parts of the country have escaped.

In the open country of the plains states, tornadoes occurring in daylight hours can often be seen approaching, sometimes a quarter of an hour before they strike. There is a swift exodus of families into basements or storm caves. Experienced persons in these sections often seem to develop a knack for recognizing "cyclone weather," and are alert to take refuge when threatening clouds loom up. This results in many unnecessary rushes to basements and caves, but it saves human life when a tornado really strikes. In large cities, with vision cut off by buildings and the warning roar of the storm muffled by city noises, there is seldom any notice of a tornado until buildings begin to crumble. Life then becomes a matter of chance.

A tornado, still miscalled a cyclone in spite of the educational efforts of the Weather Bureau, is caused under certain conditions by abnormally warm, moist air being overrun by colder air. The warm air, being lighter, is forced up through the colder, much as a cork is forced up in water, and its movement is governed by the same law of moving liquids that sets up the whirl in a draining bath tub, except that in the case of the tornado the movement is upwards.

The usual description by persons who have seen the start of a tornado is: "Two clouds

Spread Disaster

This splinter was driven deeply into the post during a small tornado in the suburbs of Topeka on June 3, 1927. E. C. Corkill, Weather Bureau official, is examining the splinter, which could not be removed without breaking.

Some of the damage is shown at the left after a tornado killed 203 persons and caused $6,000,000 damage in and about Gainesville, Ga., last April 6. Inhabitants of Hartner, Kans., dived into their caves so rapidly that the above twister passed without fatalities on June 2, 1929.

seemed to come together." A violent whirl starts at the cloud level and bores its way down towards the earth's surface. When it reaches the ground destruction begins and dust and dirt drawn up soon make the cloud a menacing black color, usually with much lightning and hail.

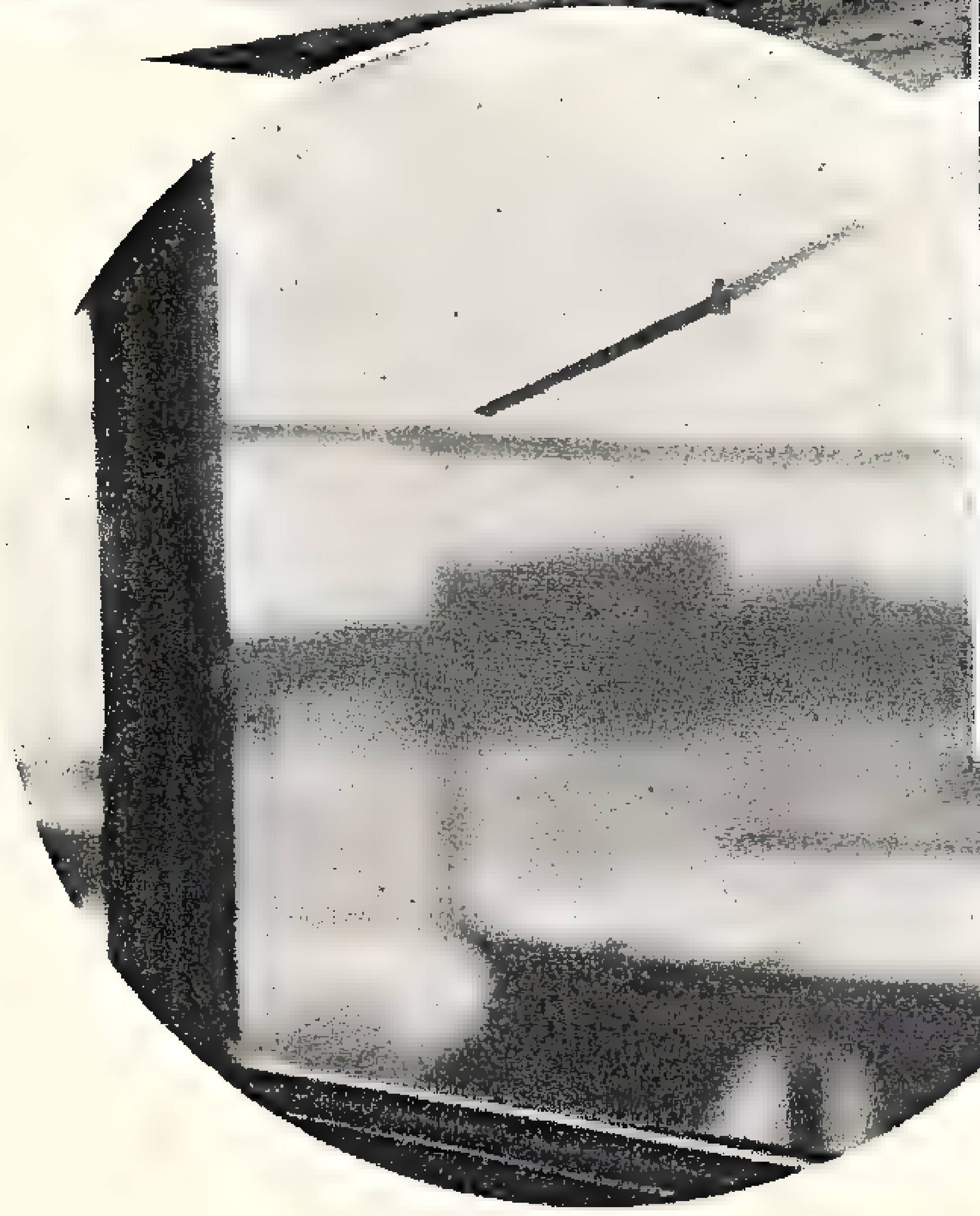
The speed of the whirling winds in a tornado has never been measured, but has been estimated at 300 to 500 miles per hour. The decreased pressure inside the whirl, similar in a way to the vortex in a draining bath tub, actually causes buildings to explode when the normal atmospheric pressure inside the walls is suddenly exerted against the lowered pressure outside as the tornado passes over.

Tornado clouds are generally spoken of as being funnel-shaped, but eye witnesses often describe them as resembling ropes dangling from the sky, as "snakes in the sky," or more commonly as resembling an elephant's trunk. The latter is a very apt description, as the cloud has a tendency to sway back and forth as it moves along its path. A collection of almost 200 views of tornado clouds in the Topeka Weather Bureau, probably the largest collection of its kind in the world, shows some that are inclined from the vertical until they are almost horizontal, some that seem to be bent into right angles, some that are larger at the bottom than at the top, and some that are huge vertical columns.

Tornadoes travel along their paths at what in these days is considered a moderate rate of speed—usually 30 to 40 miles per hour, and seldom more than 60 miles per hour. They can readily be out-run by a person in an automobile with an open road ahead. It is even possible to avoid them on foot, if they are seen in time, by running at right angles to their path, preferably towards the north

2702 Tornadoes Recorded in 20 Years

These are the ruins of the Trinity Episcopal Church at Yazoo City, Miss., after the tornado of April 30, 1933. There was loss of life and property damage in many parts of the South on that date.



A wooden splinter driven through a plate glass window at the Santa Fe store house in Wellington, Kans., during a tornado Nov. 18, 1934, is shown in the circle. The photograph above was made 75 miles southwest of Winnipeg, Canada, on May 23, 1933. Tornadoes have occurred in western Canada as well as almost every part of the United States.

or northwest, if a person is directly in line with their advance.

Straws are found driven into trees, timbers are driven through other timbers or trees, chickens are often stripped of their feathers, sometimes without serious damage otherwise, and miraculous escapes are reported along with a grewsome list of casualties.

In the Gainesville, Ga., tornado of last April 6, an automobile was thrown into a hole left by an uprooted tree. A tree was snapped off and then rammed down into the ground a short distance away and left standing upright. One house was lifted up eight feet, according to an occupant, let down again, then picked up and turned over. A freight car was found on its side, with the heavy wheels and truck nowhere in sight. A large hog was picked up somewhere in the suburbs and set down on a public square without being injured.

In a Louisiana tornado a few years ago a rooster was carried several miles and set down in another flock of chickens. In the Great Bend, Kansas, tornado of November 10, 1915 an unmailed letter was carried 85 miles to the northeast; and empty flour sacks from a wrecked mill were scattered over an area miles distant from the storm. In another Kansas tornado a herd of cattle was struck and sailed through the air like birds.

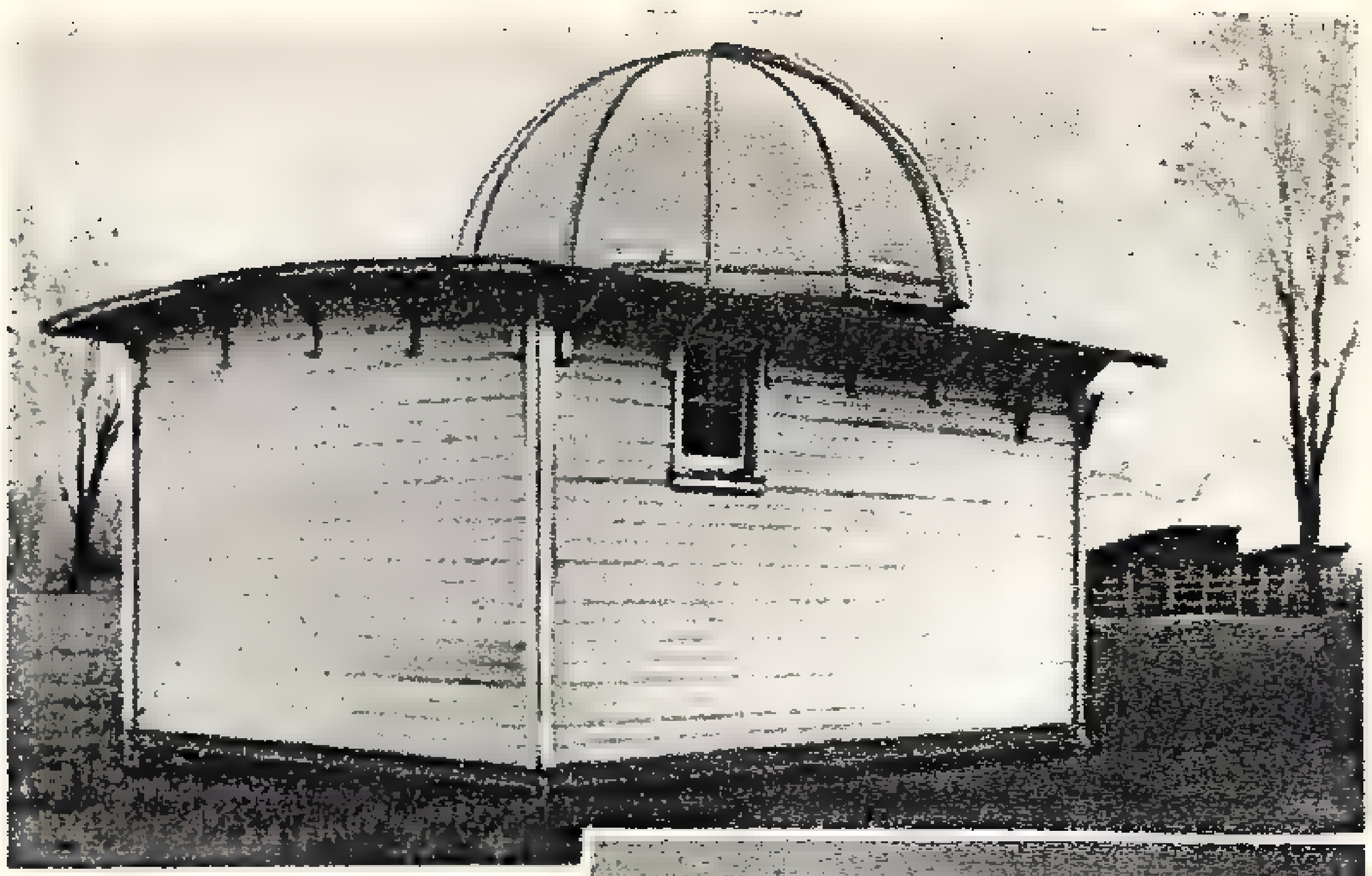
In the great Murphysboro, Ill., tornado of May 18, 1925, a piece of house siding was blown entirely through a 2x6 timber, and the tongue of the siding cut a clean groove as it passed through.

In a tornado at Wellington, Kansas, November 18, 1934, a wood splinter was driven through a large plate glass window in the Santa Fe Store House, cutting a clean hole without cracking the glass.

[*Continued on page* 144]

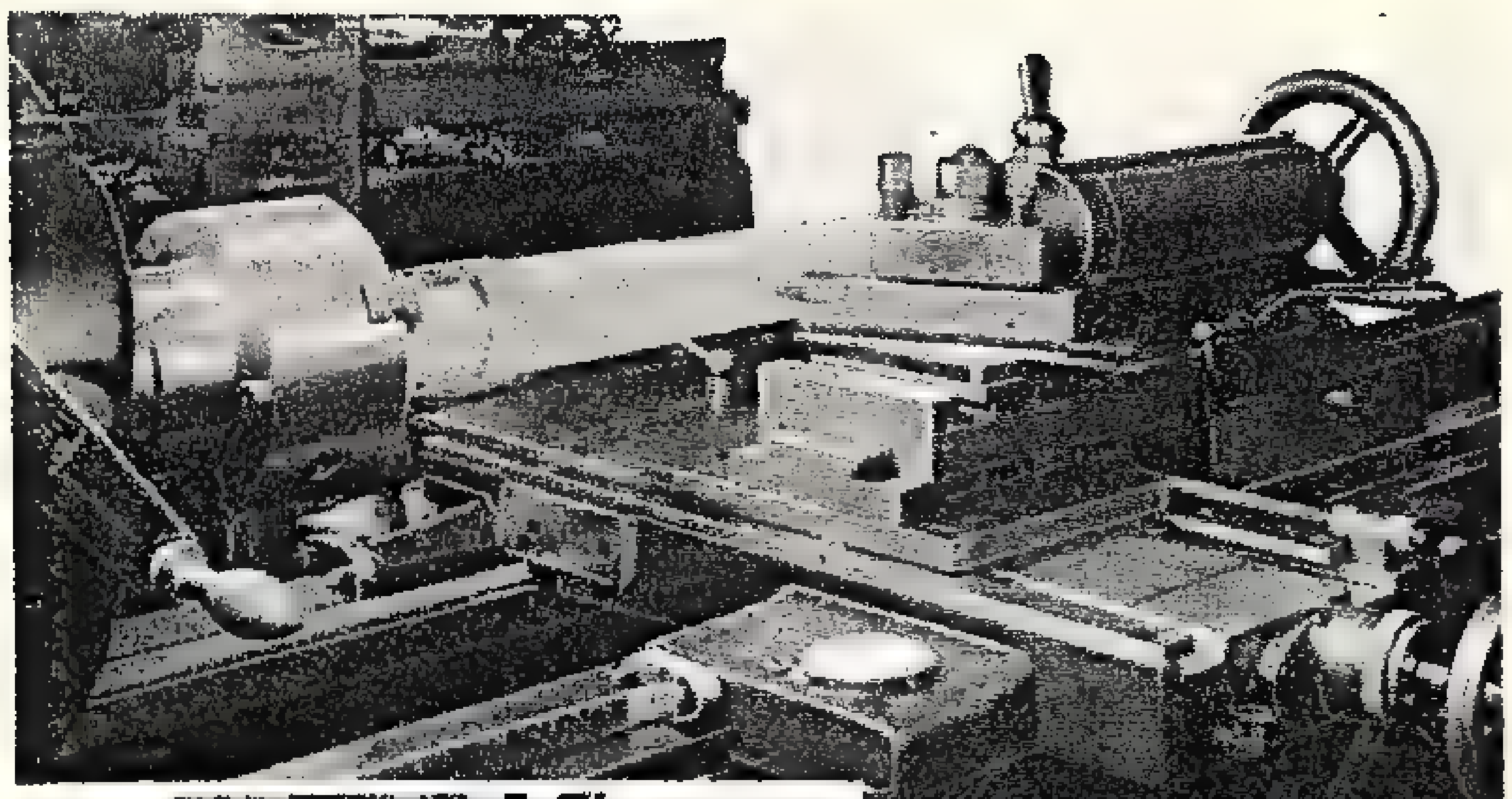
Brilliant New Comet Found By Young Garageman

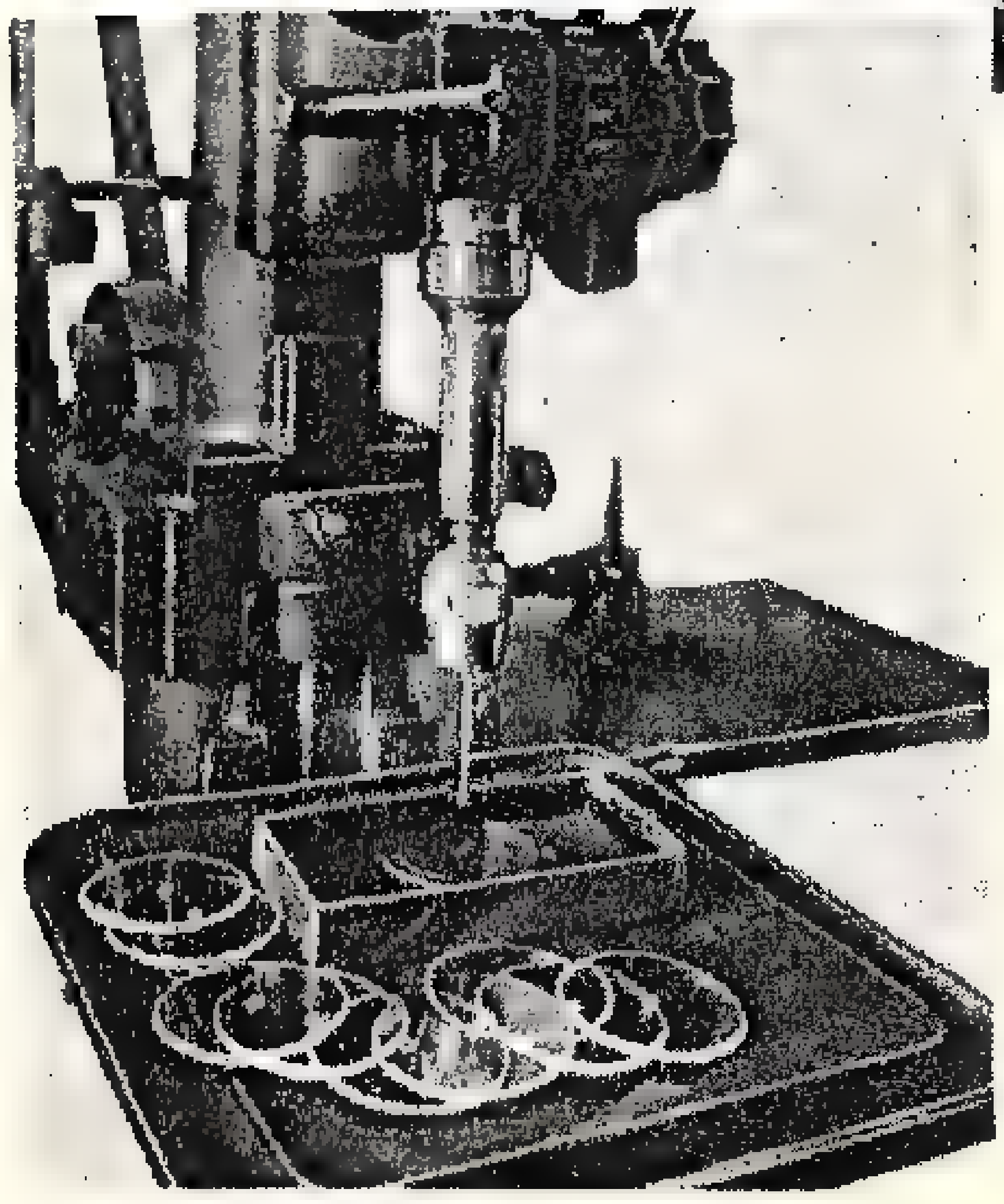
IN THE northern skies has been found another comet, and credit for its discovery goes to Leslie A. Peltier, who works in a garage by day and studies the stars at night. He lives on a farm near Delphos, Ohio, where he has a home-made observatory. His 6-inch telescope was loaned him by Princeton University. To date Peltier has discovered five new comets, all of which have been named for him. As a reward for his good work, Peltier was made guest of honor by the American Association of Variable Star Observers at Harvard University and received the first merit award ever conferred by them.



Above is shown the home-made observatory of Leslie Peltier, amateur astronomer and discoverer of five new comets. He is known as the world's greatest variable star observer. All of Peltier's knowledge was gained at home through reading and observation of the heavens. The comets he discovered were named in his honor.

New Metal Turns Glass Like Wood





These pictures were taken at the recent "New Material" exhibit at the Deutsches Museum in Munich. The smaller picture shows the new widia tipped boring tool drilling holes in glass discs immersed in oil. The larger picture shows the tool turning a glass roll on a lathe.

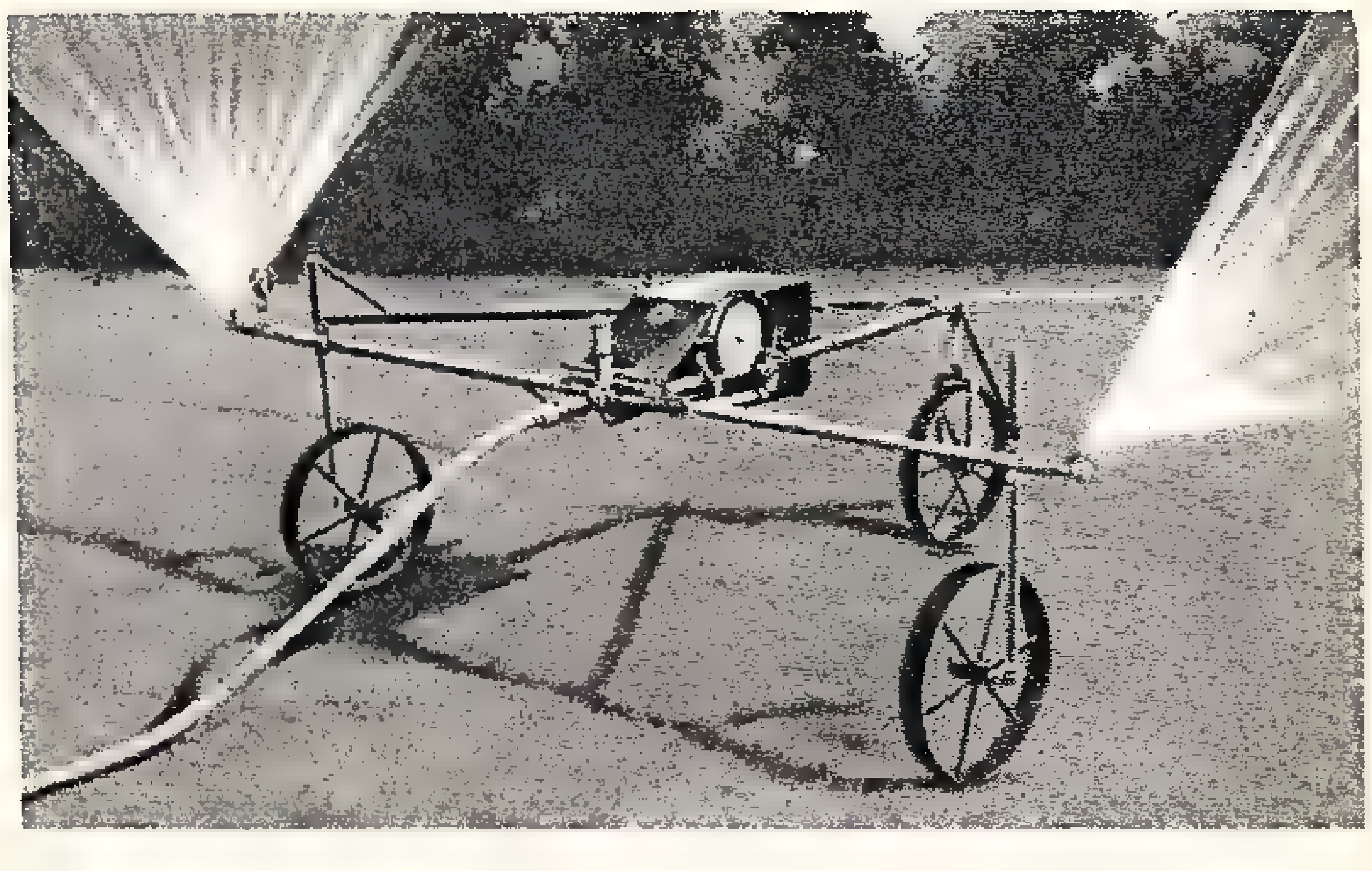
SAID to be as hard as diamonds, widia, a new metal invented and developed in Germany, is used to make machine tools for working glass, porcelain and other of the heavy combinations known as "carbides."

Tools made with widia are used in ordinary machines and will work glass in every way that woodworking will work wood, such as planing, boring, mortising, turning—straight or tapered, beveling, producing curved surfaces, decorative designs and so forth. No matter now how hard the product, it can be accurately finished to a thousandth of an inch.

Lawn Sprinkler Pulls Itself Along

ELIMINATING the constant moving necessary to the ordinary types of lawn sprinklers, a Beverly Hills, Calif., irrigation equipment company features portable, automatic sprinkling machines.

Wire cable is wound around a drum mounted on the machine, one end of which is attached to a stake the desired distance across the lawn, with a sliding stop threaded on the wire and tightened. The sprinkler travels across the lawn until it reaches the stop, which trips a valve and shuts off the water. The rate of travel is about forty feet an hour. Distances of 200 to 400 feet can be covered at one setting.

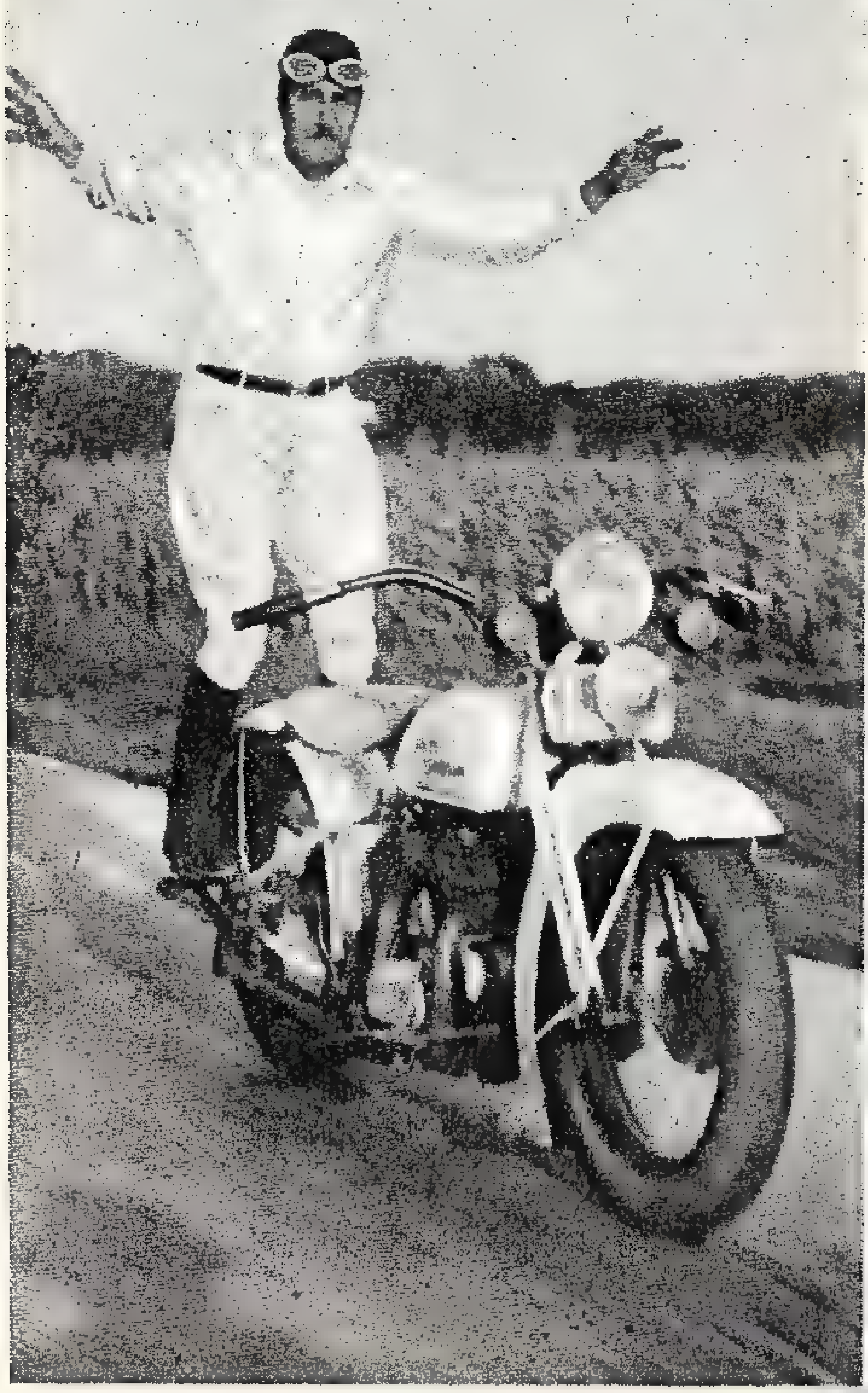


The portable traveling lawn sprinkler is a new development in automatic irrigation. It gives square watering and even coverage, and operates successfully on 35-pounds pressure.

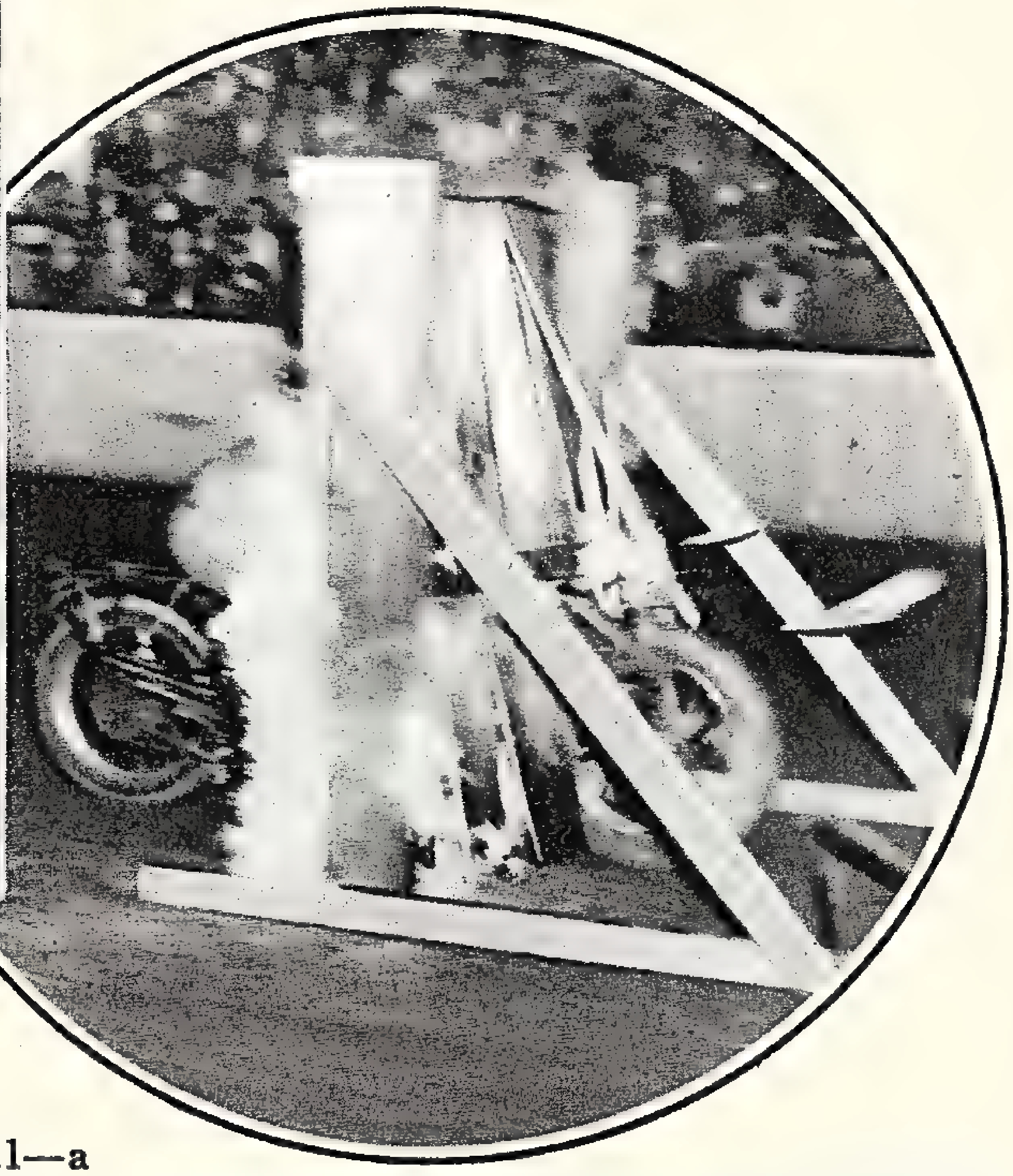
STUNTING *on a*

F. LELAND ELAM

tells the inside story of professional stunt motorcycling—riding the bronco bikes.



It looks easy but it really isn't. This champion rider illustrates a riding pose which, difficult as it is in itself, is the basis for shooting balloons, juggling balls, riding backward and other antics.



San Francisco's Don Rodman, a super daredevil, claims that crashing The Wall of Death is only dangerous to those who haven't the feel of their wheel, who are nervous and careless.

THRILLING, exciting, sensational—a three-word description of motorcycle stunt riding. Since the introduction of night lighted stadiums, oval track motorcycle racing is growing fast in popularity and with this breath-taking sport has come the rebirth of stunt riding.

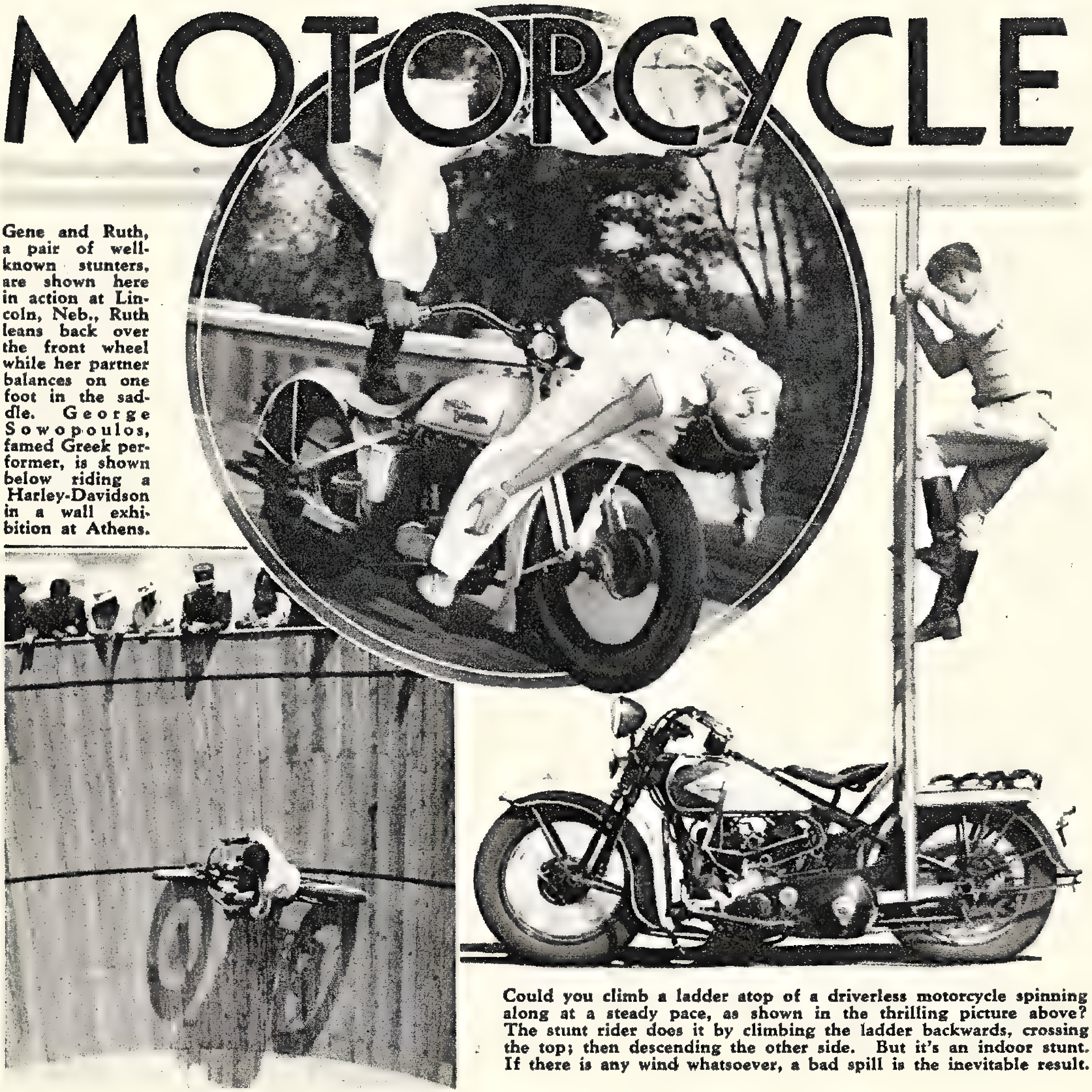
Putt Mossman, Oakland, Calif., champion stunt rider is taking its popularity around the world. He is touring with a group of riders.

"Any person who is physically fit and can ride a motorcycle can learn to do stunts," explains Lawrence N. Weaver, prominent California stunt rider, and a member of the California Highway Patrol. "They must, however, have a perfect sense of balance to be able to carry on with stunts after they start them or an accident will result. They must have that sixth sense which automatically tells them just where to put their foot or which way to sway their body. They must be cool and not nervous, have no fear, and be confident.

"Partner stunting is the most difficult. They must have perfect confidence in each other. They must synchronize in their work.

"There are no set rules for doing certain stunts. Each rider must work out his own procedure as best suited to his own build and weight. All real stunting motorcycles are lower than stock machines although a stock machine can be used for many stunts. The safest stunting speed is from 30 to 35 miles an hour. There are many different stunts and only a few that are new. There is a future in motorcycle stunt riding for the persons who can meet the requirements."

MOTORCYCLE



Gene and Ruth, a pair of well-known stunters, are shown here in action at Lincoln, Neb., Ruth leans back over the front wheel while her partner balances on one foot in the saddle. George Sowopoulos, famed Greek performer, is shown below riding a Harley-Davidson in a wall exhibition at Athens.

Could you climb a ladder atop of a driverless motorcycle spinning along at a steady pace, as shown in the thrilling picture above? The stunt rider does it by climbing the ladder backwards, crossing the top; then descending the other side. But it's an indoor stunt. If there is any wind whatsoever, a bad spill is the inevitable result.

One of the most thrilling of motorcycle stunts is wall crashing, says Weaver. At night it is exceptionally spectacular. The requisites for this stunt are steady nerves, a sturdy and speedy machine.

The wall is six feet square. It is constructed of boards ¾-inch thick and six inches wide, nailed on a frame of 2x4 foot boards with 4x4 foot posts at each side. The rider always picks the wall boards as they must be soft, fir being used mostly, free of knots, and straight of grain.

A piece of mosquito netting is tacked loosely on the side from which the crash is to be made. Excelsior is placed between the wall and netting. Coal oil is poured over it. Just before the rider starts on his 70-mile-an-hour ride the material is set afire. When the wall is crashed the rider passes not only through a wall of wood but a wall of flame.

Metal hand guards and a metal helmet are the only protective measures taken by the rider. A horseshoe shaped frame of steel extending from the front wheel forks over the handlebars and down to the other side of the wheel is used sometimes instead of the plates on the handlebars.

It is necessary for a rider to take many positions on the cycle and he must have a feeling for the proper position for his feet so as to get the correct balance. Among these stunts are ones in which the rider stands on the seat. While this is no easy trick, it is made difficult by shooting balloons, playing a drum, juggling balls, and riding backward.

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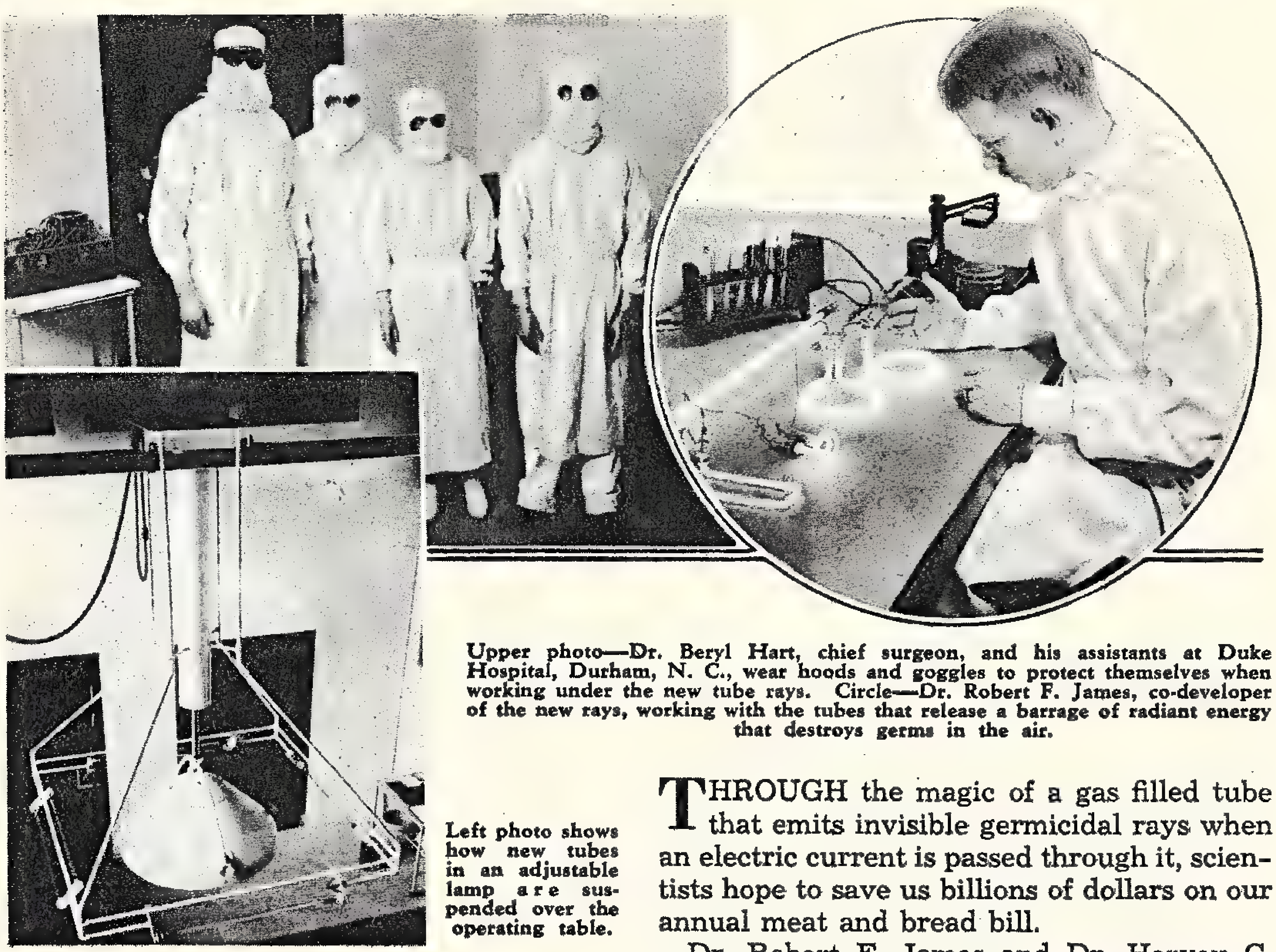
Bacteria-Killing Tube Sterilizes Air



Upper photo—Dr. Beryl Hart, chief surgeon, and his assistants at Duke Hospital, Durham, N. C., wear hoods and goggles to protect themselves when working under the new tube rays. Circle—Dr. Robert F. James, co-developer of the new rays, working with the tubes that release a barrage of radiant energy that destroys germs in the air.

Left photo shows how new tubes in an adjustable lamp are suspended over the operating table.

THROUGH the magic of a gas filled tube that emits invisible germicidal rays when an electric current is passed through it, scientists hope to save us billions of dollars on our annual meat and bread bill.

Dr. Robert F. James and Dr. Harvey C. Rentschler developed the tube in the research laboratories of the Westinghouse Lamp Co., after years of experimenting. The tube consists of a slender glass tube containing a special gas. When electricity passes through the gas it emits rays that will kill the micro-organisms associated with food spoilage in packing plants and warehouses.

Aside from its commercial possibilities, the new ray is being used in the medical field as the energy rays emitted by the new tube have been found to kill air-borne bacteria in a few seconds thereby offering a solution to the long baffling problem of contaminated air in hospital rooms. In operating rooms it has been found that the new ray will effectively protect the operator and assistants from contamination and minimize danger for the patient.

Tests have shown that post-operative fevers of patients who were operated upon under the radiations of the new tube have been markedly lower and their convalescence more rapid. A transformer using less power than is consumed by a 25-watt lamp will operate tubes.

Plane Builder Wins Collier Trophy

DONALD WILLS DOUGLAS, airplane designer and manufacturer of the famous Douglas Sleeper Planes was awarded the 1936 Collier Trophy for the year's outstanding contribution to aviation. The award was based on the performance of the DC-2 a 14-passenger, twin engined all-metal monoplane with a speed of 185 m.p.h.

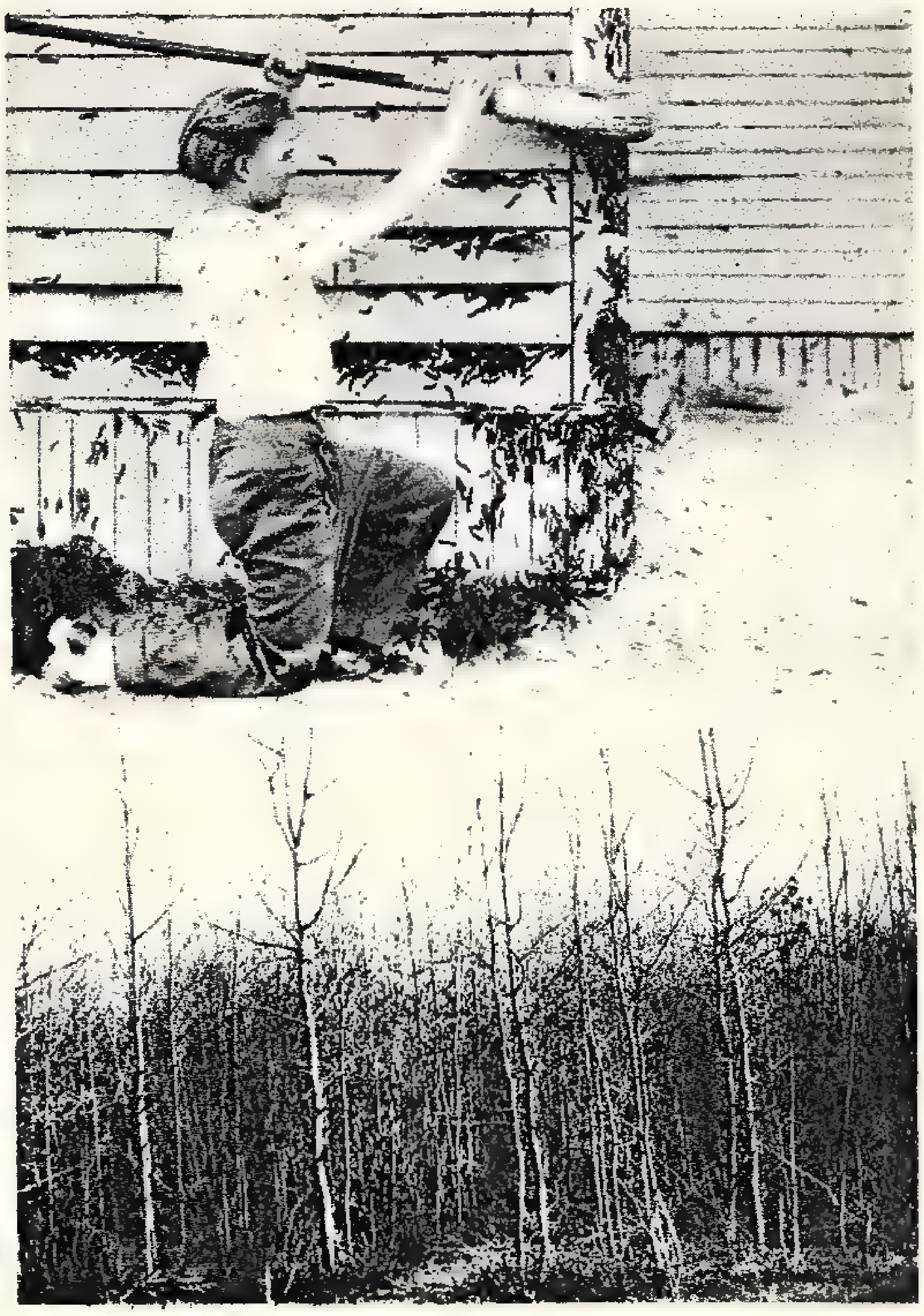
The 1936 Collier Trophy was won by Donald Douglas. He is shown receiving award from President Roosevelt. C. Horner, president of the National Aeronautic Association, is at left.

Caterpillar Hordes Invade Forests And Homes

CRAWLING in massed millions over an area of 8,000 square miles in Northern Ontario, tent caterpillars have stripped forests of foliage, stopped trains and destroyed crops. The squirming scourge has even invaded schools, homes and stores in its relentless advance.

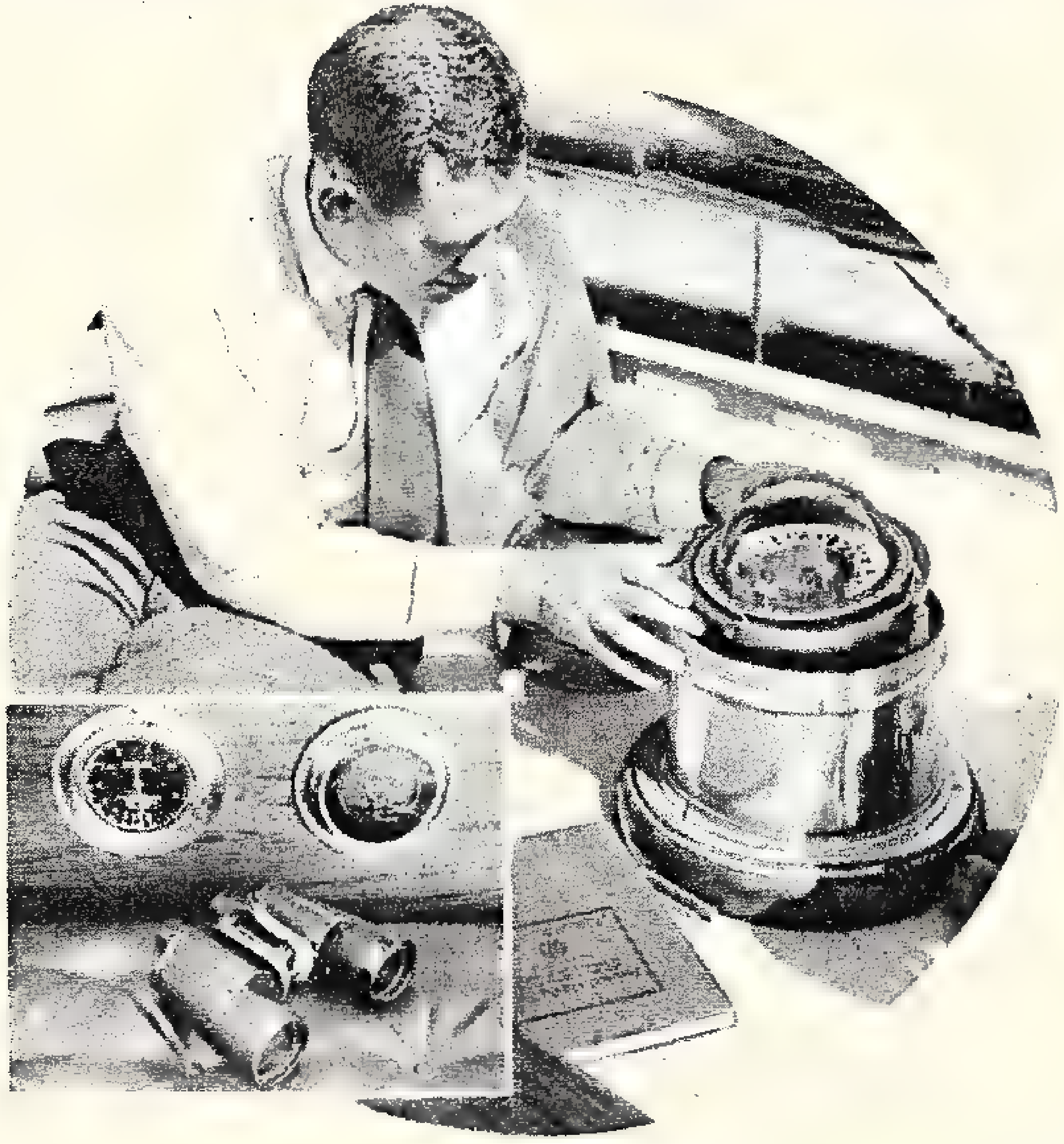
Dr. F. C. Craighead, of the bureau of entomology and plant quarantine, U. S. Department of Agriculture says that the caterpillars are to be less feared in this country than the plague of grasshoppers which has become a serious menace in Oklahoma, Kansas, Montana, and a few counties in northwestern Illinois.

Lack of funds with which to secure poison bran bait, the standard means of grasshopper combat, has hampered many states in their war on the pests.



Top—This Ontario school girl is trying to sweep away the crawling pests that have invaded her school building. Below—Ontario's forests have been left almost leafless.

Compass Shows Change Of Course



This new type of tele-magnetic compass which is electrically operated permits the yachtsman to control the course of his ship by remote control from points aboard ship.

A TELE-MAGNETIC compass that registers immediately when a craft has left its course has been invented by F. W. West, a young yachtsman. The new type compass enables the helmsman to ignore his regular compass once the course has been set. Power for the instrument is derived from a battery or a small generator.

Rubberized Fabric Covers Balloons

A NEW synthetic rubberized fabric will increase the life of balloons when used in place of the regular rubber covering. Recent tests indicated that the new fabric, known as DuPrene and developed in the laboratories of the Du Pont Co., has a greater tensile strength and is less affected by weather conditions.

A recheck of the permeation of the hydrogen supply of the test balloon indicated superior results when using the new fabric. Du Prene proofed fabric retained its normal physical properties and characteristics after six months of weather exposure.

16,000 feet of DuPrene fabric 36 inches wide was used in the construction of this new C-3 type Army balloon. The new synthetic rubber covering has all cemented seams.

Auto Triumphs Feature

Part of the imposing $2,250,000 Ford show is shown in upper left. General Motors has a $950,000 display in the above building.

Three marionettes of the Sue Hastings troupe ride in a train made of Chrysler parts displayed at Dallas.

Frances Nalle, 21, red-haired Dallas beauty, is official "Bluebonnet Girl" at the Exposition. A robot made of auto parts draws a crowd at the left.

Texas Centennial Show

Decked with the traditional Lone Star flags, this Court of Honor is one of the principal features of the $25,000,000 Texas Centennial celebration at Dallas. The Hall of Petroleum appears in the background. A night view of the Esplanade is shown in the star with searchlights illuminating the scene in the Hollywood manner.

EXHIBITS showing automobile advances in speed and safety are almost half of the dollar value of the $25,000,000 Texas Centennial display now attracting visitors by the thousands to Dallas, Texas.

Largest exhibitor at the celebration marking the 100th anniversary of Texas freedom is Ford with a $2,250,000 display. General Motors has a building and display valued at $950,000. Chrysler is present with a $500,000 exhibit. The event continues through Nov. 29.

The Ford show includes 15 major exhibits in the air-conditioned Ford Exposition building. A replica of the company's by-products plant, complete to railroad sidings, attracts model railroad enthusiasts. There is a service exhibit showing the development of auto service from the blacksmith days to the present.

All of the exhibits show methods of testing materials and means of assembling. A mechanical man made from auto parts is a feature of the Chrysler show. He not only turns his head and lifts his arm but he can hear and speak as well.

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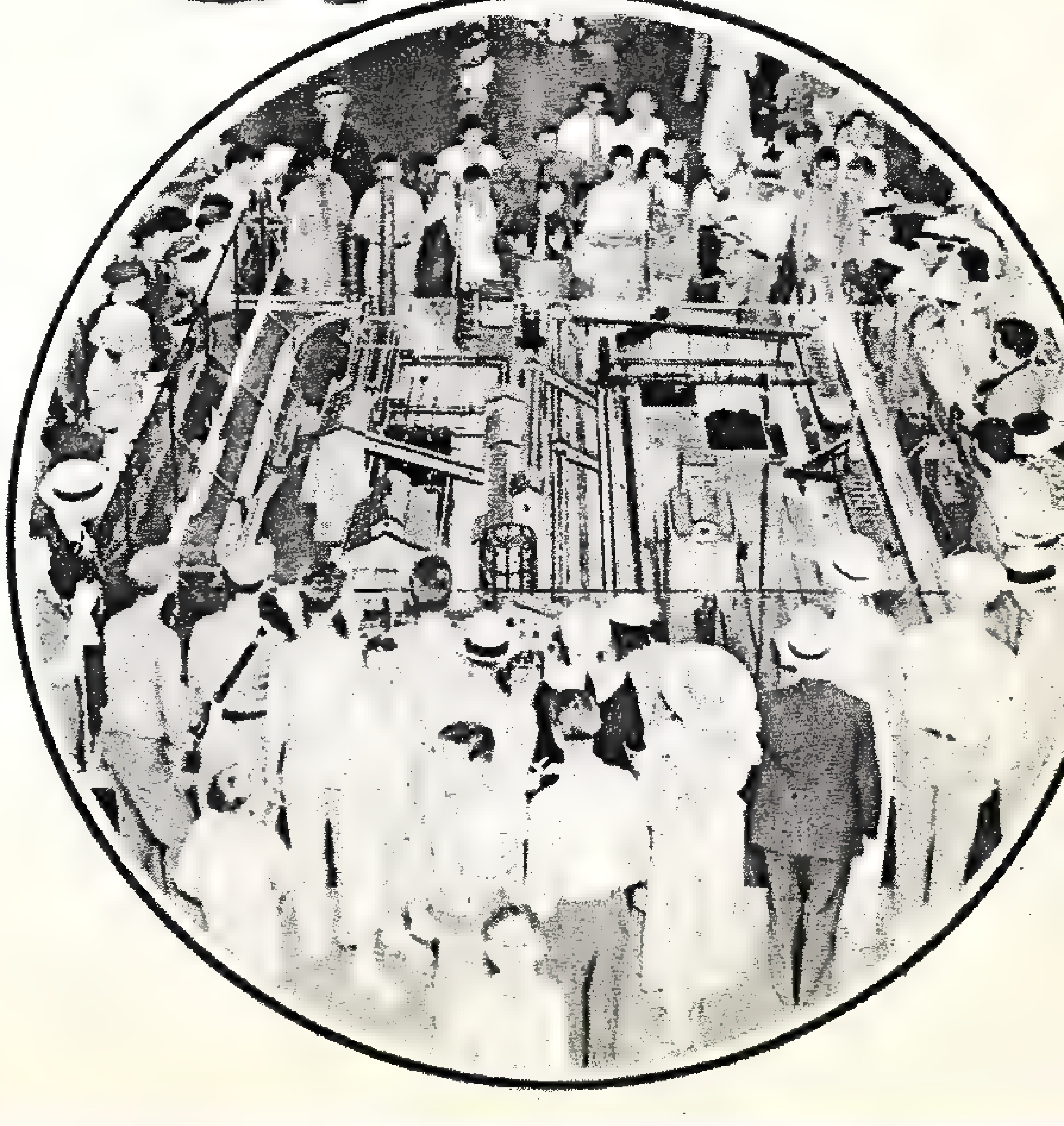
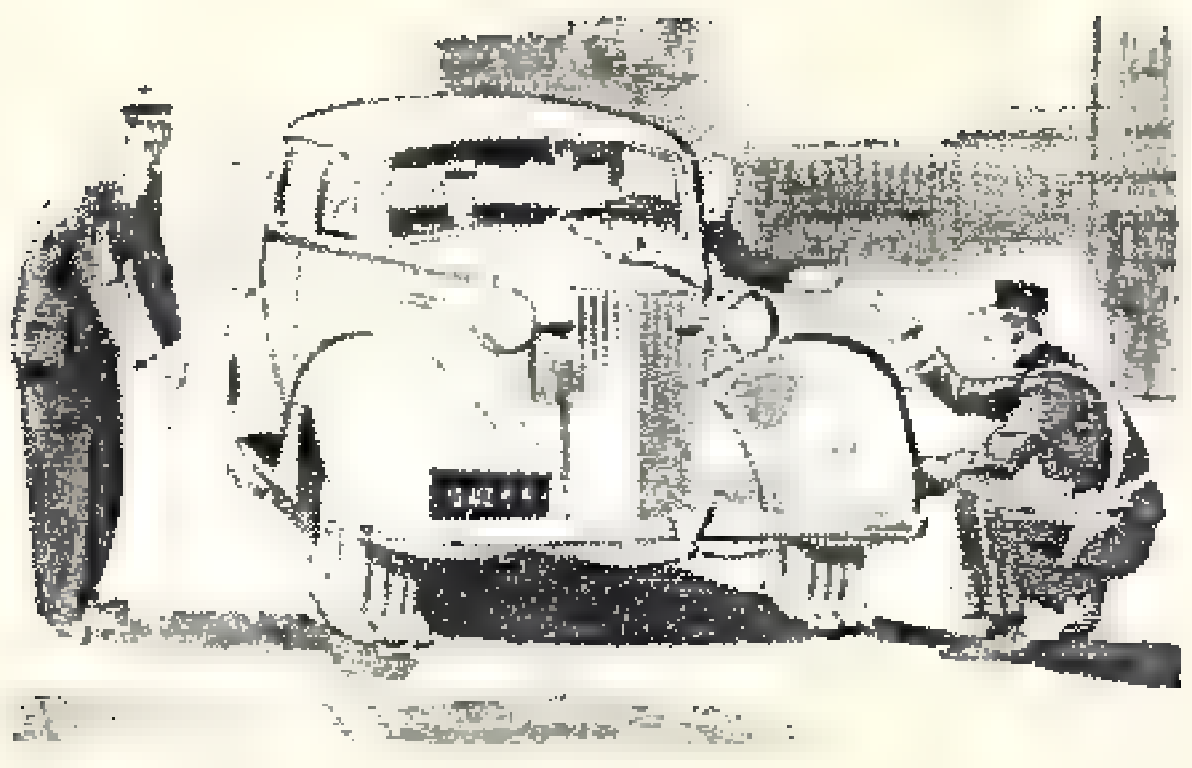
Pretty Jane Collins is one of the "Rangerettes" adding beauty and color to the show. Below, a replica of the Ford by-products plant, complete to railroad sidings, attracts scores of visitors.



PARAGRAPH ODDITIES

OF SCIENCE

Traffic officers in Yugoslavia punish speeders by deflating their tires. Free air pumps are few and far between, creating an embarrassing situation. It works. — S. L. Harmon, Doylestown, Pa.



The cost of building the average railroad is so great that the money, in dollar bills, would cover its length and width.—Fred Raymond, Garson Mine, Ont.

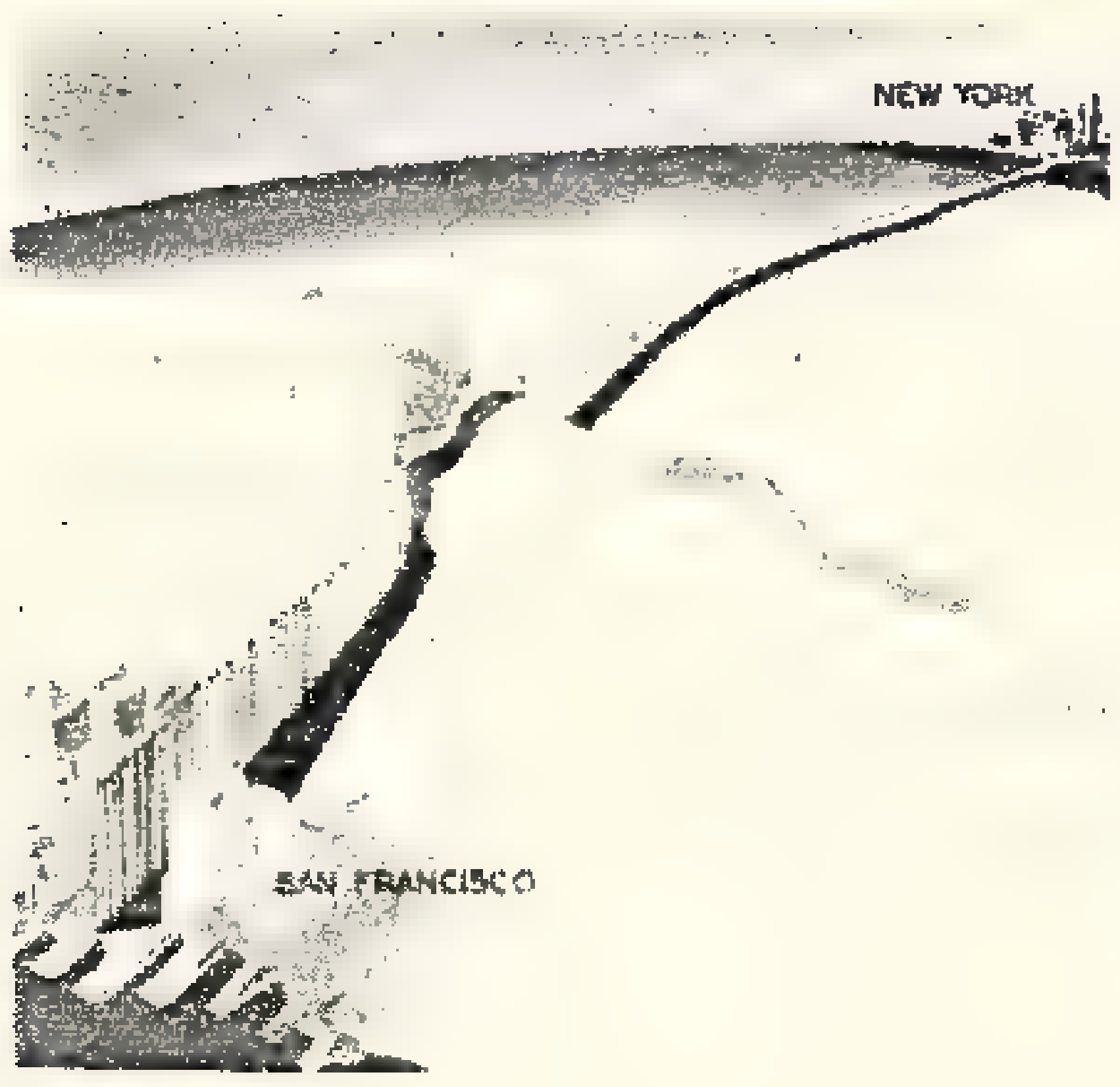
To aid the olive industry in Tunis the government has decreed that all automobile lubricating oil used in the country must contain 20% olive oil.—Walter Hagen, Britton, So. Dakota.

It would cost nearly $3,000,000 to make a complete collection of the major stamps of the world.—M. Mulford, Buffalo, N. Y.

A clock that didn't run was one of Edison's most valuable inventions. The dummy clock, located in his Ft. Myers, Fla., laboratory, reminded workers that time was measured in results, not minutes.—John Frank Dopak, Jr., Chicago, Ill.

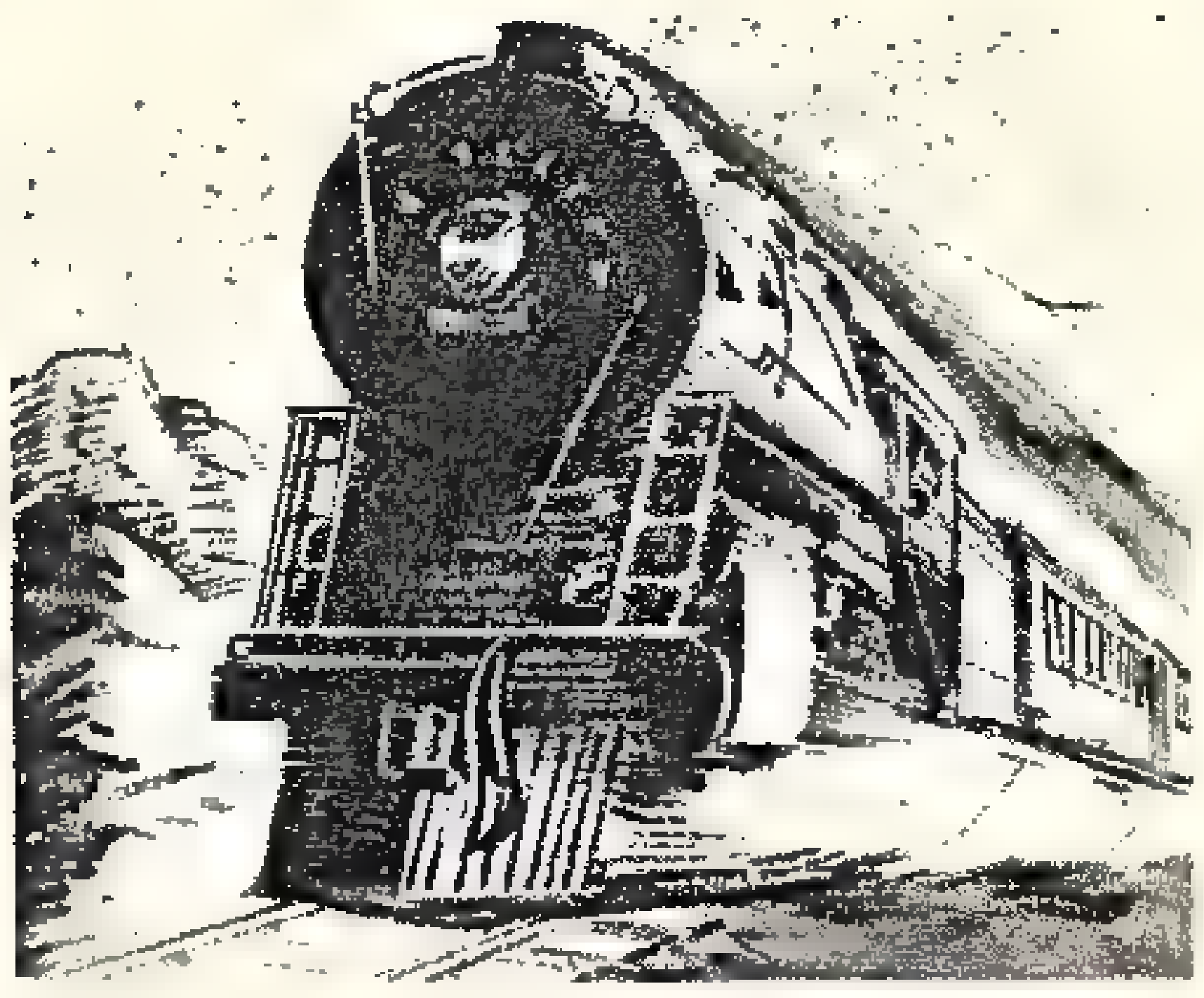
The winter of 1936 was so severe that fifty years from now it will still be the subject for comment according to leading forecasters.—Frank Harris, Portal, North Dakota.

More than $150,000,000 was expended by autoists last year in replacing worn parts on their cars.—John H. Gulick, Cleveland, Ohio.



The poles used by one telephone system are the equivalent of a solid fence 30 feet high reaching from San Francisco to New York. — Morris Hall, White Plains, N. Y.

The piston of a locomotive is always advancing. It returns only in relation to the engine's frame. — Rudolf Trimmel, Wien, Austria.



The human body carries enough electricity in its red corpuscles to keep a 25-watt lamp burning for 5 minutes.—Ralph Sullivan, Boston, Mass.

Flat cars, though lighter than box cars, are the hardest for the locomotive to pull, having greater inertia.—M. N. Crowe, Souris, Man.

A phosphorescent automobile enamel recently demonstrated in Paris makes it possible to see vehicles a half mile away with the headlights turned off.—Mrs. Nella Canfield, Estherville, Iowa.

Although temperatures on the moon vary from 250 degrees below to 200 degrees above zero, F., one inch below the surface the temperature is a constant 32 degrees.—M. Gold, Philadelphia, Pa.

Particles of dye must be one seven-millionth of an inch in diameter to satisfactorily penetrate the pores of cotton.—B. Miller, Minneapolis, Minn.

A space ship could travel to the moon in 3½ hours by standing still. The moon, swinging on her orbit, would overtake it.—H. L. Kidder, Rock Springs, Wyo.

Special bull shoes of two pieces are being used on Nevada range bulls to prevent sore, stone bruised feet.—F. S. Reynolds, Fort Morgan, Colorado.

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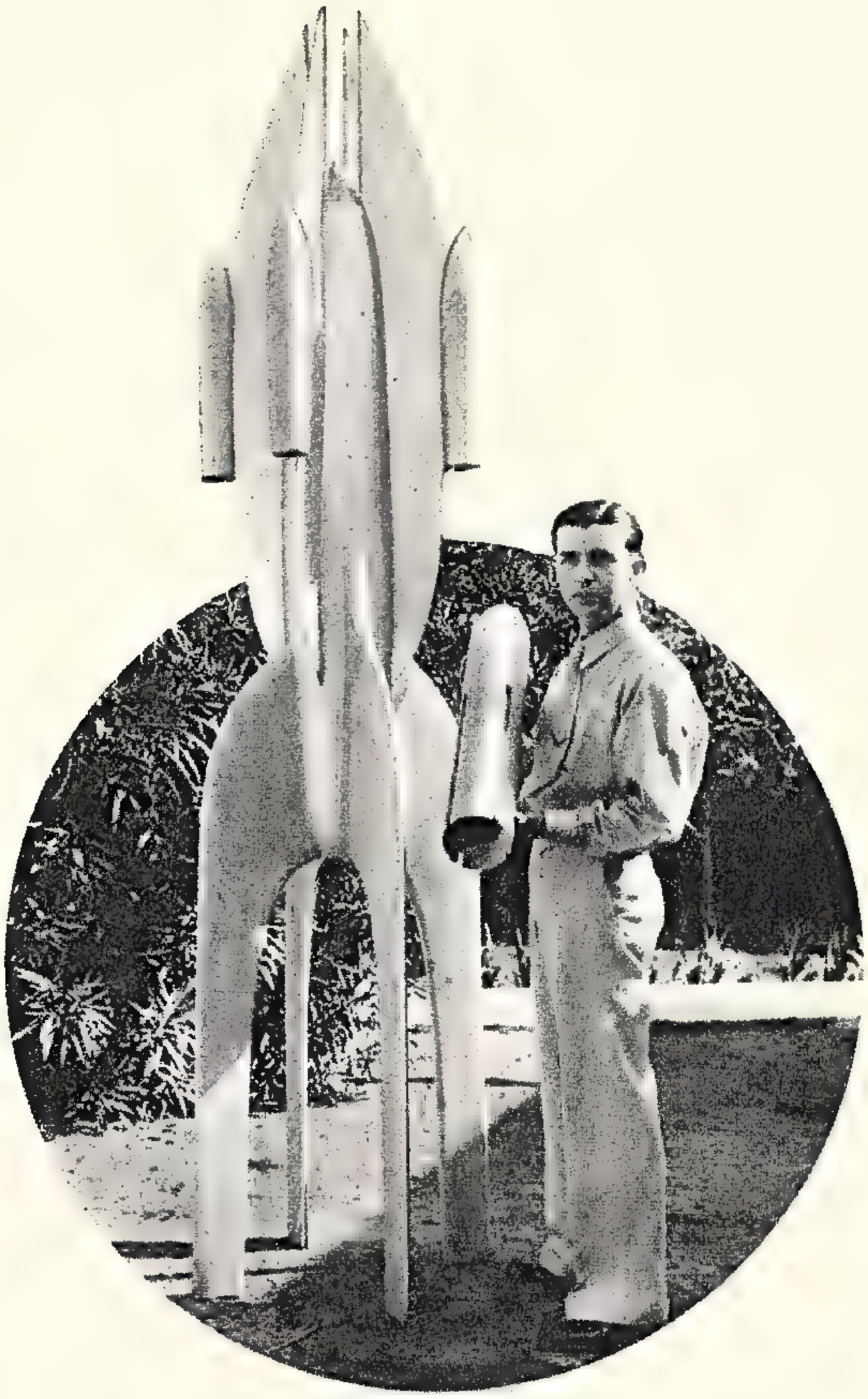
New Stratosphere Rocket Claims 200-Mile Ceiling

A ROCKET designed for flights into the stratosphere carrying scientific instruments which will record temperature, cosmic radiations, and general stratospheric conditions has been invented by Maurice Poirier, of Burbank, California. It will weigh 175 pounds and, for the protection of persons below, will explode when its maximum height has been reached. A small parachute will enable the scientific instruments to reach the earth safely.

The builder asserts that the rocket will be capable of reaching a height of over 200 miles above the earth's surface and will be able to attain a speed of more than 25 miles per minute. The power is generated by the mixing of two gases known only to the inventor. No date has been set for the flight.



Flashing through the stratosphere at 25 miles per second, this rocket is expected to reach a 200 mile height. It will carry aloft instruments that will descend via a parachute after the rocket has exploded harmlessly in mid-air.

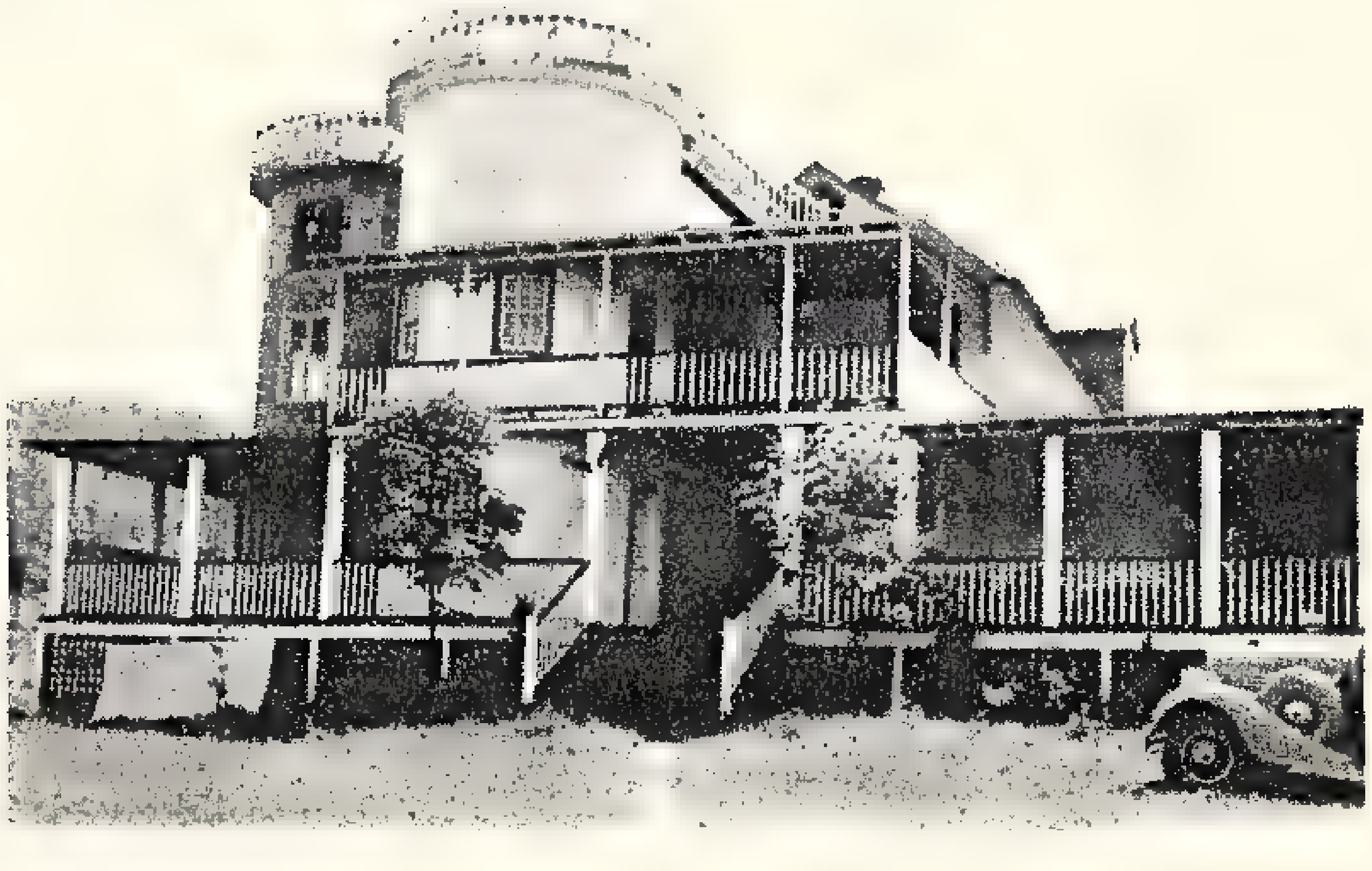
Serves Same Railroad 81 Years

Eighty-one years of continuous service without an accident or loss of a day's work is the world's record of 98-year-old John M. Horan. He is a boiler washer inspector.

AN UNUSUAL record of 81 years of continuous service with the Milwaukee Road is held by "Johnny" Hogan, 98-year-old veteran. He is a boiler washer inspector and developed the idea of using soda ash in the treatment of water in locomotive boilers. A staunch supporter of the Safety First movement, Horan has never had an accident nor missed a day's work. Residing in Milwaukee, he still puts in a good day's work.

Silos Become Observation Towers

TWIN silos that once stored feed for live stock of a dairy farm have been converted into observation towers at a summer camp near Peekskill, N. Y. Some farmers there have found it more profitable to cater to the tourists than to undertake the tilling of the soil. The observation platforms on the silo roofs have proved very popular.



Observation towers and porches, as well as cool rooms, are features of these two renovated farm-yard silos.

SPORTSMEN'S TACKLE FOR THE BEST

by ROBERT PAGE LINCOLN

A GREAT satisfaction to the bass fisherman is a tackle outfit that will give him the maximum in enjoyment in handling, but which will, at the same time, touch the peak in effectiveness: The right rod, the right line and the right lure for the occasion. That bass may be taken at times on very crude tackle goes without the saying, but it is not all of fishing just to fish.

Fishermen are rapidly getting in the habit of using both a bait casting rod and the fly casting rod in their fishing, having come to a realization of the fact that where the one will not avail itself, there the other one may prove unusually effective. To be efficient in both departments is, therefore, to a decided good effect and gives one the unusual opportunity of testing out both methods of fishing where the situation calls for one or the other lure and manner of delivery. Obviously the fly rod has no place in the midst of the pads and other vegetation when the bass are in such locations. Here the bait rod, with various weedless pork-rind and wire-guarded lures, will prove effective. But where unobstructed water is to be met with, around rocks, sunken trees, stumps, etc., there the fly-rod will do wonders, and may produce bass when the bait rod will be found wanting. Drop a fly in combination with a spinner on a shaft in these last-named locations, and it is a wise bass indeed that does not make a dash at it with deadly effect.

The bass fisherman, therefore, who carries with him both the fly-rod and the bait-rod has at his command two deadly weapons, for which any bass water affords an opening. It is because the bait rod and fly rod can thus work together so effectively that the fisherman should possess and should become proficient in the use of both rod types and their methods.

Bait casting for bass is, without doubt, more commonly practiced throughout the country than any other manner of taking bass.

The first bait rods that were put forth in this country were rather long, ranging in length up to eight feet. From this extreme

No bass fisherman can resist the lily pads. Here lurk the big large mouth, waiting to be tempted by a pork-rind lure or any other weedless baits. This lake is typical.

The small mouth bass is one of the gamest fish in fresh water. This catch represents a day of thrills for three men. Either bait rod or fly rod lures can be used against this battler, depending upon type of water.

CAMPFIRE SUGGESTIONS BASS FISHING

length they went to the other extreme and dropped down to as short as 3, 3½ and 4 feet. In more recent years this rod length was stepped up to the extent that 5 and 5½-foot rods are now considered standard for length, although 4½ and 6-foot rods are to be had, the latter especially fitted for the casting of very light lures.

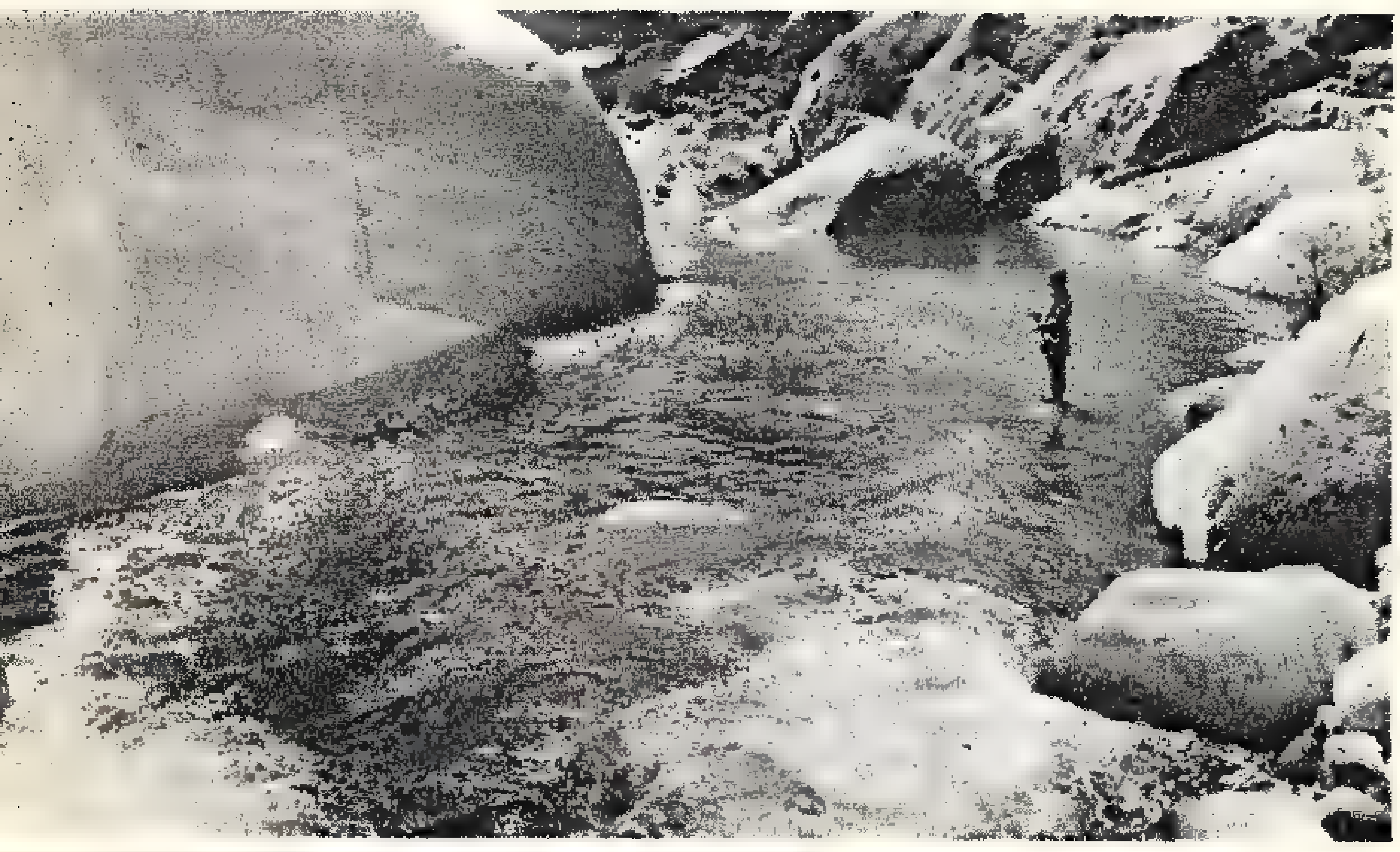
It is obvious in the selection of a bait casting rod in bamboo that it should be picked according to the weight of bait that is to be used. There are light, medium, heavy and extra heavy bamboo rods. That fishermen attempt casting heavy lures with a too-light bamboo rod accounts for breakages every season. It is obvious so far as bamboo rods are concerned that they should be definitely picked according to the work they are supposed to do. *To treat a bamboo rod otherwise is sheer injustice.*

Certain features with regard to the fittings of the bamboo bait casting rod may be mentioned. Guides are fitted with garnix linings, also agate lining, also in a stainless steel chrome plated. Agate lining is excellent, but the steel guides are now fast coming into prominence. Both agate and garnix guides will crack and break, but steel guides invariably hold their own.

The handle should be of the best grade solid cork and there should most assuredly be a forward grip, that is a grip ahead of the reel. This grip permits of a sure and comfortable hold on the rod. Without it one does not have the proper control over the rod. Again, there should be a finger pull under the reel seat, which the trigger finger can grasp when casting. The value of the finger-pull lies in the ease and sureness with which the rod may be handled. Those rods not fitted with finger-pulls, may have detachable ones slipped on. However, most bait casting rods now are supplied with these pulls.

Bamboo rods generally come in single enamel, six strip construction. Double built rods involve the lamination of two pieces of the outer or fibrous enamel of the bamboo, and cutting V-shaped strips from the same,

[*Continued on page* 137]



Like trout, small mouth bass prefer fast water, although now, due to stocking, they are found in both streams and lakes. In this water, a fly rod is a big advantage.

A short cast into fast water, and Robert Page Lincoln has hooked another one. He is playing this small mouth with a five and one-half foot steel bait rod, one of the most popular lengths.

Fire Alarms, Flashed By Radio, Bring Prompt Response

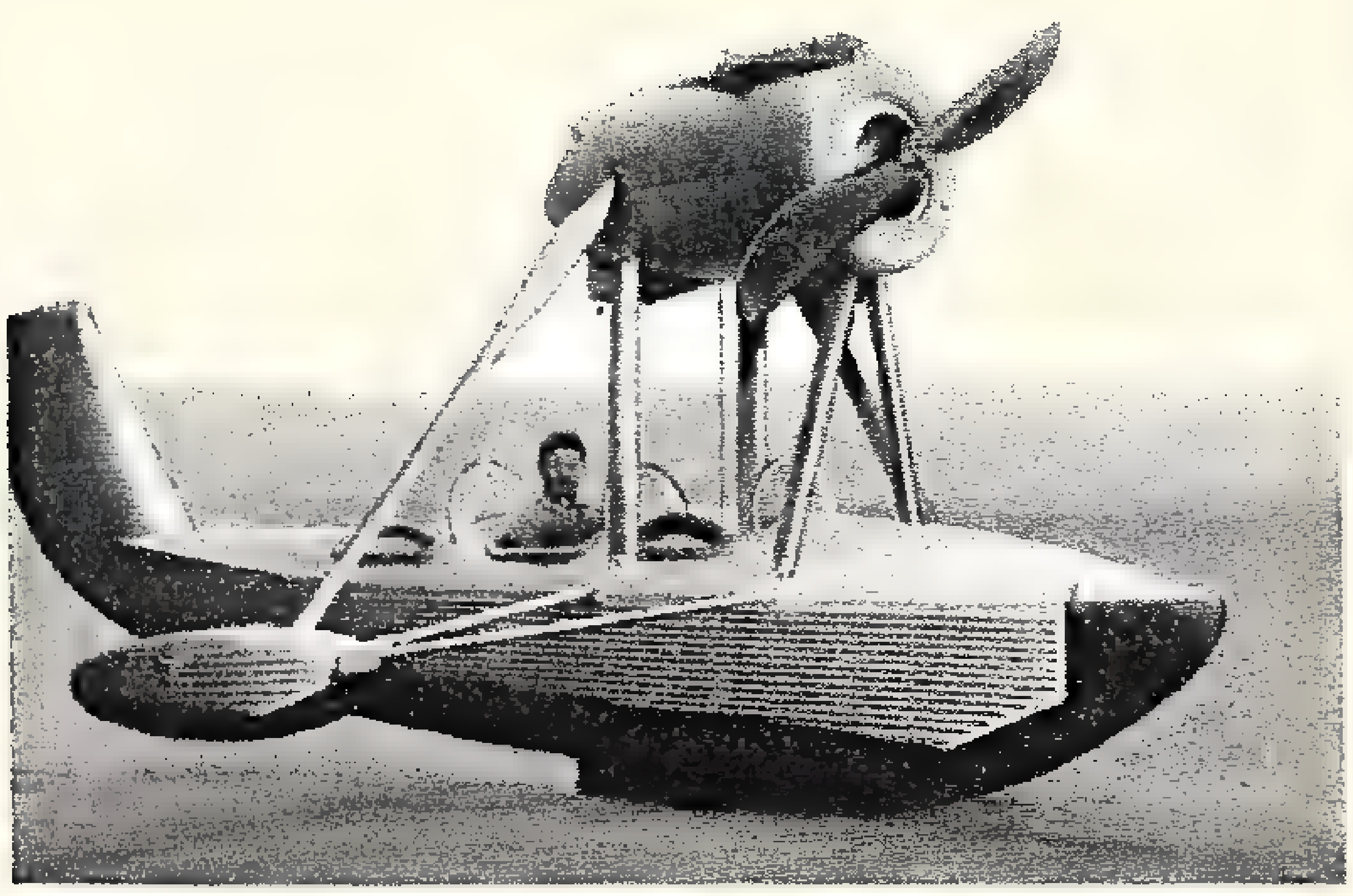
Chief Thomas Burns, of the Bridgeport, Conn., Fire Department broadcasts the first message over the Talkalarm, a radio fire alarm system. Inset shows loud speaker installed at fire station.

Speed Boat Modeled After Seaplane

SEAPLANES skimming across the water before taking off provided German naval architects with the cue for a new type of speed boat, embodying all the features of the plane except the wings.

For lightness in hull construction a corrosion proof alloy called ultra-aluminum is used. On a straight course the broad hull rises almost out of the water at high speeds, while on the turns rigidly braced outriggers provide stability.

Engineer H. Ellinghausen of Bremen and Naval Architect Fritz Peschkes of Cologne are leading experimenters in this type of boat. New improvements are expected to increase their speed to more than 60 m.p.h.

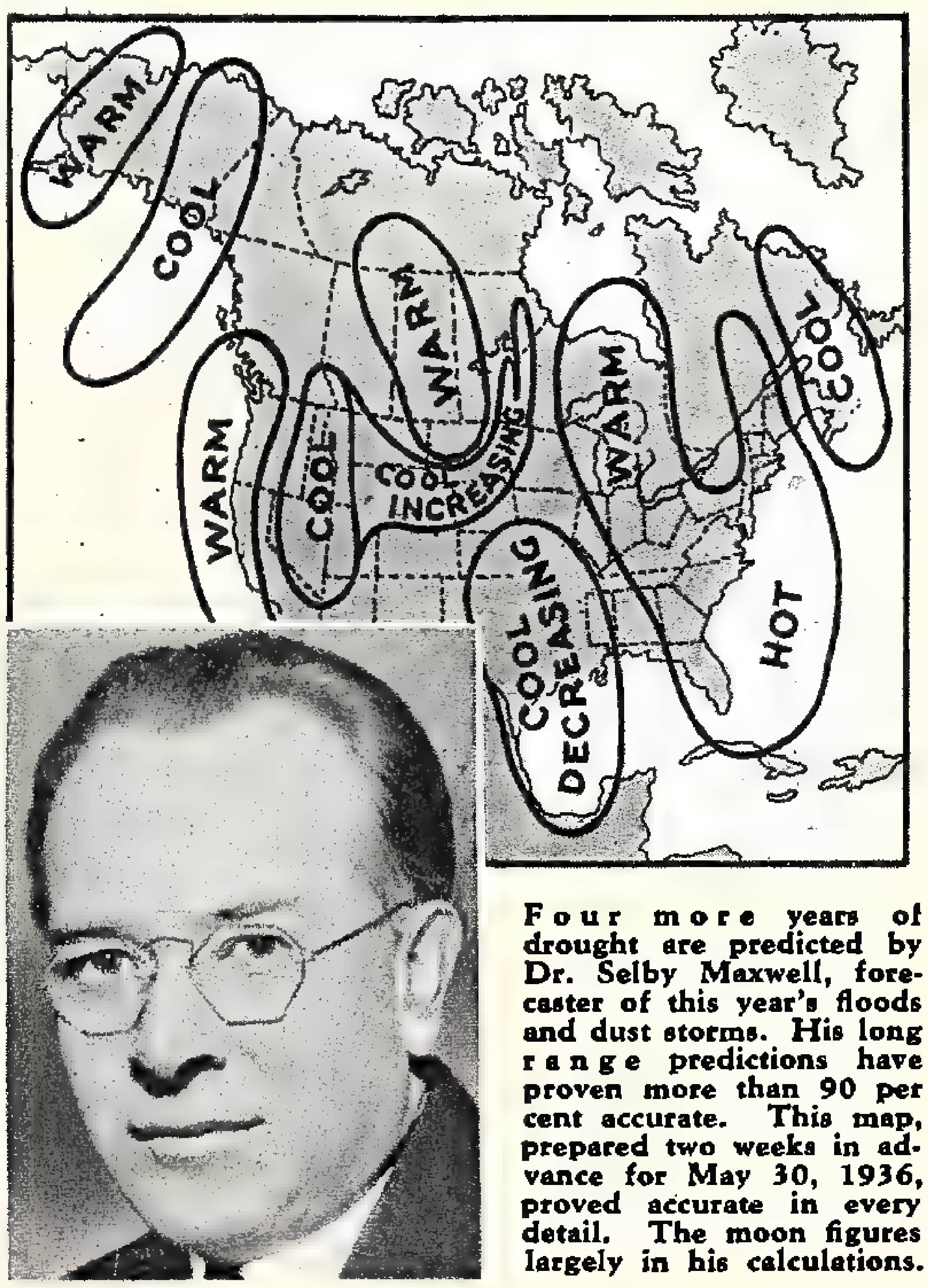


Speed boating reaches a new peak in thrills in one of these wingless seaplanes. A standard airplane motor and propeller lift the aluminum hull almost clear of the water at high speed.

WHERE once a steel tire rim, struck with a heavy hammer, summoned the fire department of Bridgeport, Conn., there now is employed a radio Talkalarm system, the first of its kind in the country.

The Talkalarm system has a central unit about the size of a PBX telephone board. At each fire station is a reproducer. When an alarm is turned in the dispatcher summons all stations to attention with a "siren howler" installed in the central unit. There then follows a verbal description of the fire's location and equipment needed. In this way the response is speeded up and there is no possibility of signal bells being misinterpreted through a miscount.

Key Found To Long Range Forecasts



Four more years of drought are predicted by Dr. Selby Maxwell, forecaster of this year's floods and dust storms. His long range predictions have proven more than 90 per cent accurate. This map, prepared two weeks in advance for May 30, 1936, proved accurate in every detail. The moon figures largely in his calculations.

COMBINING three sciences, mathematics, astronomy, and meteorology, Dr. Selby Maxwell, Chicago scientist, has developed his own weather bureau, known as World Weather, Inc., specializing in long range predictions. In operation over a period of years, his predictions have proved more than 90 per cent accurate. Beyond admitting that the moon figures largely in his calculations, Dr. Maxwell will not divulge his secret.

Inventor Photographs Vibrations With Light Rays

A BEAM of light projected through a narrow slit upon a mirror proved to be the solution in the puzzling problem of how to photograph a vibration. George W. Jacobus was the discoverer of the new principle, which he incorporated into his latest invention, the vibrometer.

The mirror is floated in a hermetically sealed pool of mercury in the base of the vibrometer. Outside light passes through a narrow slit, strikes upon the mirror and is reflected through another slit to register upon moving film. The slightest vibration is picked up by the mercury, the mirror quivers in response, and the light beam traces the vibration upon the film.

George W. Jacobus is shown here with his vibrometer, or vibration photographer. As a pool of mercury in its base quivers in response to vibrations, its movements are photographed from light rays reflected from a mirror on its surface.

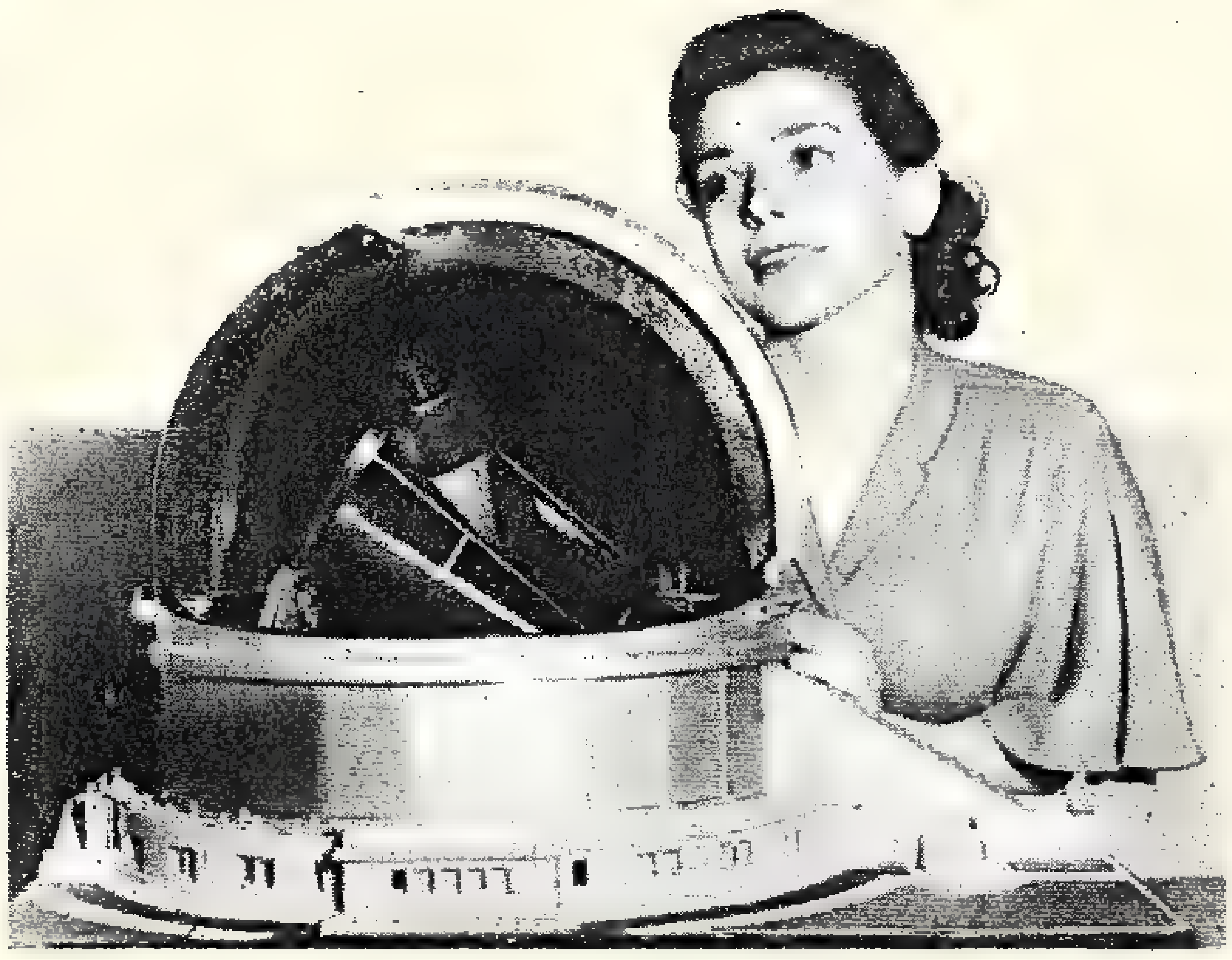
Fused Panels Replace Painted Walls

Turning a stream of water on this wall surface does not harm it in any way. Constructed of porcelain panels the wall will retain its color forever. Washing restores its color when dirty.

PANELS of porcelain enamel in a variety of colors are now replacing painted wall surfaces in many homes and office buildings. The new material which may be installed by any contractor insures a wall surface that will never have to be replaced. The panels when dirty may be restored by washing.

New Observatory Built In Miniature

IN ORDER that visitors to the Palace of Education at the California Pacific International Exposition might familiarize themselves with the new observatory now under construction on Palomar Mountain a model of it has been placed on display. Constructed to the exact scale, the model shows the new observatory as it will appear when completed and the 200-inch telescope installed. The observatory, itself, will be the world's largest.



The exact replica of the Palomar Observatory now being made ready for the new 200-inch telescope is shown above in model form where it is being exhibited at the San Diego Exposition.

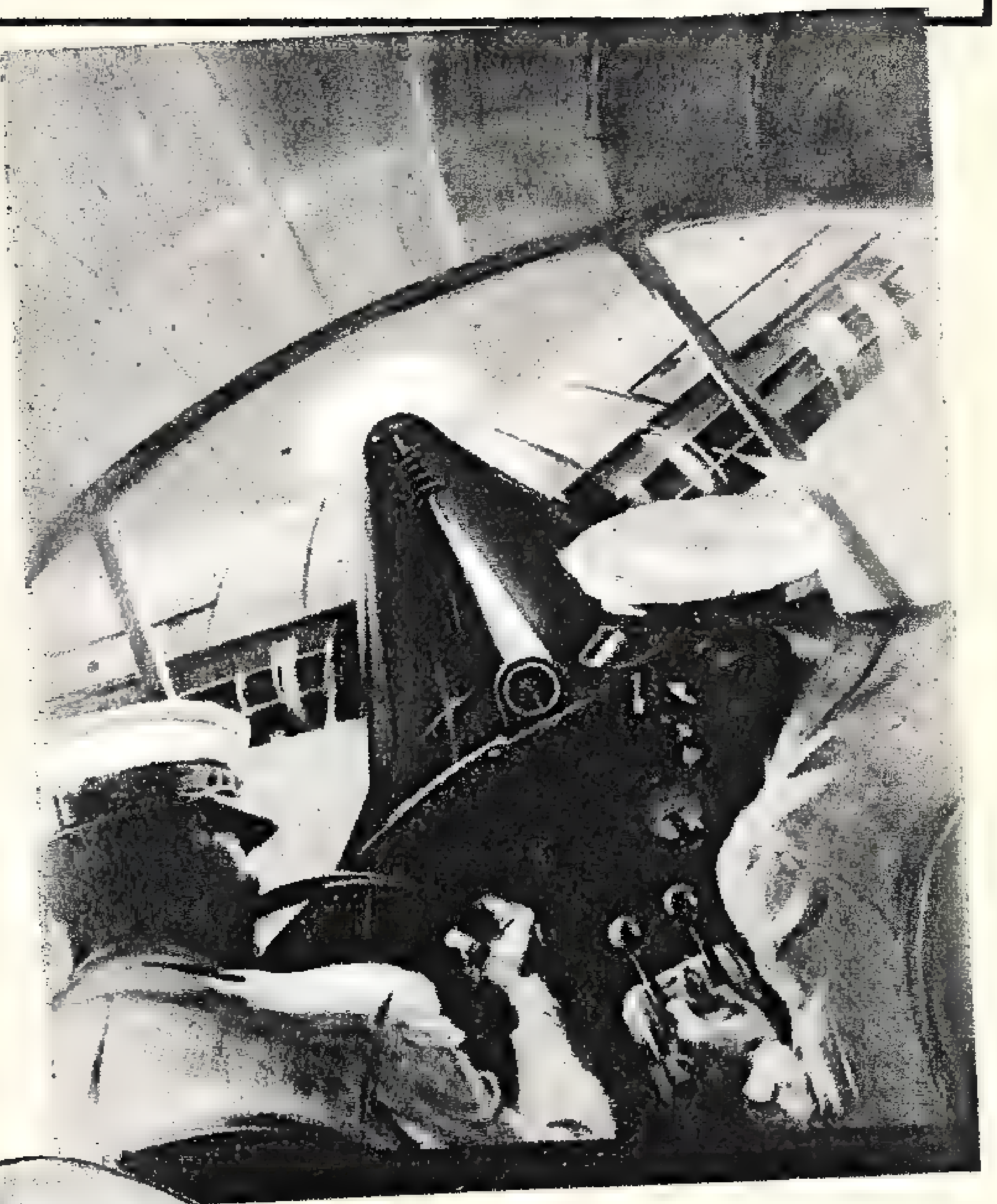
Sensational German Paddle Plane Built On "Flapping Wing" Principle

FROM Germany comes the news of another attempt to produce a plane of the rotating wing, or "paddle" variety. Unlike the well-known Dr. Rohrbach's paddle-plane design, the latest attempt to get away from conventional airscrews as a means of propulsion does not depend upon the paddles as a sole means of lift as well as propulsion. Rather, it seeks to adapt the paddle principle to an otherwise normal airfoil.

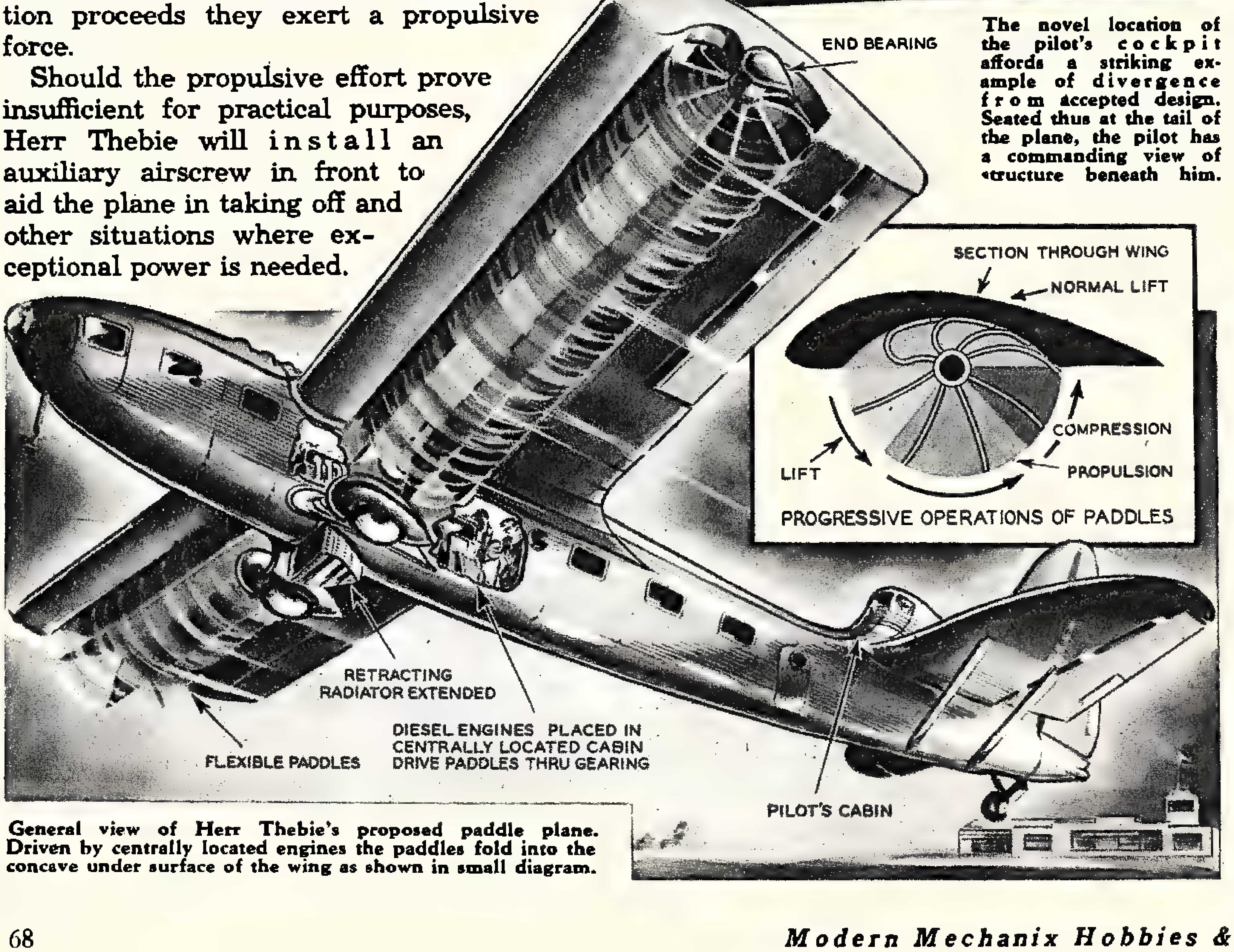
The inventor, Herr Engineer R. Thebie, of Chemnitz, after studying wing-flapping flight as practiced by birds, has introduced the results of his observations in his airplane.

The paddles project from the lower surface of the wing and, made of flexible material, fold up into the wing itself during the upper half of the revolution. The compression of air natural to a wing in flight is thus assisted. Emerging from the wing the paddles exert a downward and lifting force. As the rotation proceeds they exert a propulsive force.

Should the propulsive effort prove insufficient for practical purposes, Herr Thebie will install an auxiliary airscrew in front to aid the plane in taking off and other situations where exceptional power is needed.



The novel location of the pilot's cockpit affords a striking example of divergence from accepted design. Seated thus at the tail of the plane, the pilot has a commanding view of structure beneath him.


END BEARING
SECTION THROUGH WING
NORMAL LIFT
COMPRESSION
LIFT
PROPULSION
PROGRESSIVE OPERATIONS OF PADDLES
RETRACTING RADIATOR EXTENDED
DIESEL ENGINES PLACED IN CENTRALLY LOCATED CABIN DRIVE PADDLES THRU GEARING
FLEXIBLE PADDLES
PILOT'S CABIN

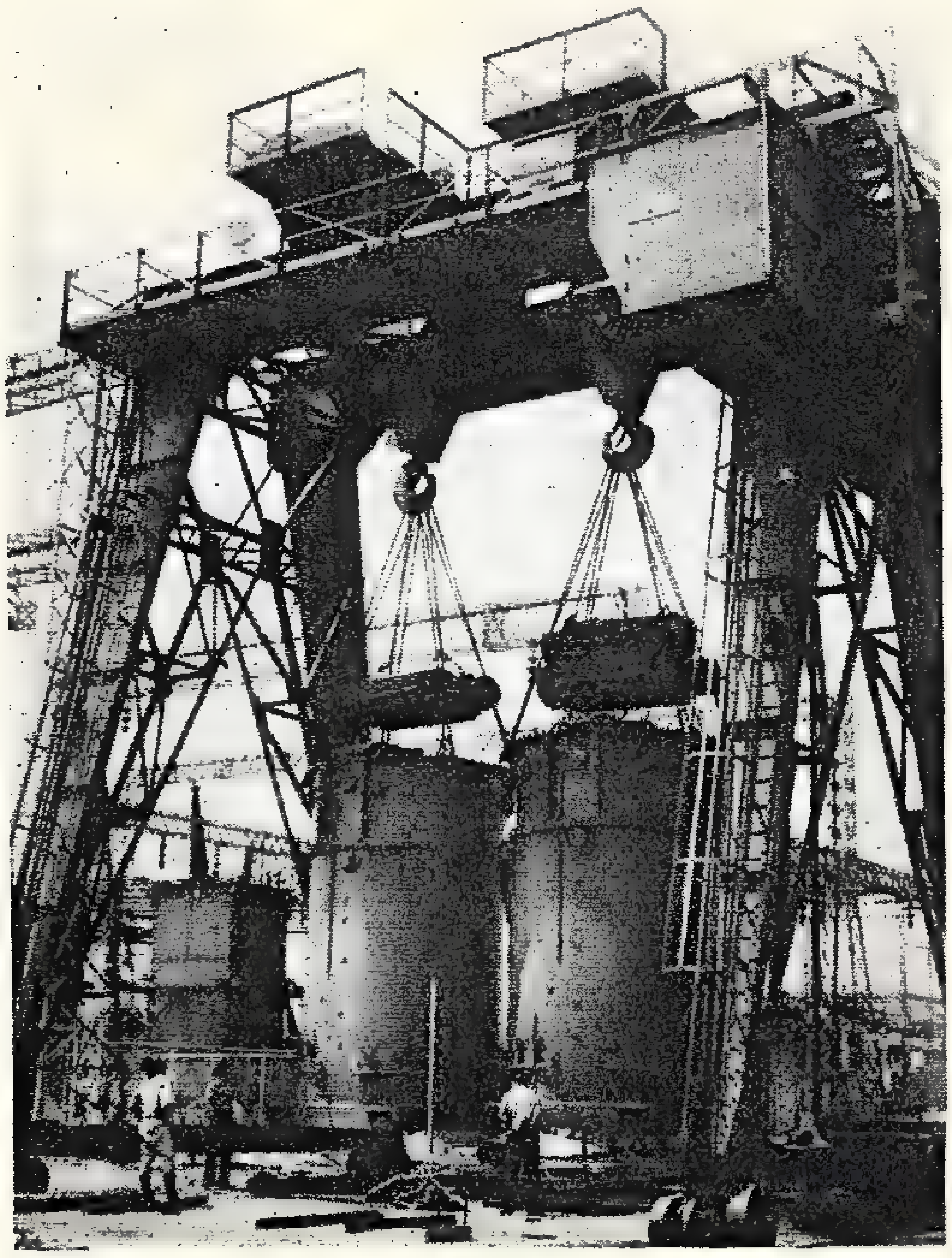
General view of Herr Thebie's proposed paddle plane. Driven by centrally located engines the paddles fold into the concave under surface of the wing as shown in small diagram.

Giant Crane To Swing Ponderous Transformers Into Power House

SATISFACTORY tests have been completed on the giant crane that is to lift the 185-ton transformers into the Municipal Power Bureau station on Central Avenue, Los Angeles. This station is the terminus of the 266-mile transmission line from the Colorado River, and the transformers will lower the voltage of the Hoover Dam power.

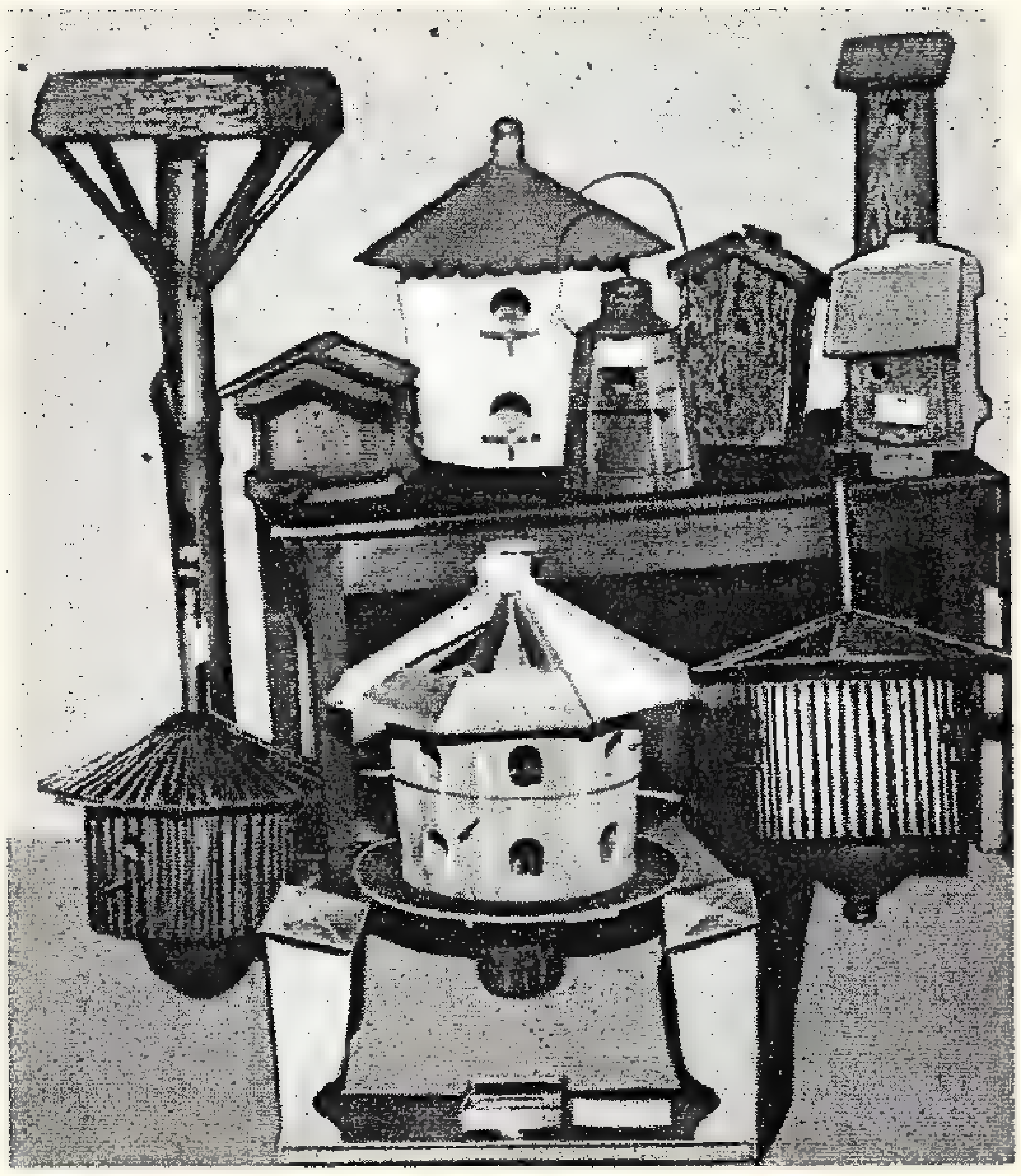
The crane is the largest Gantry type in California. It is mounted on steel wheels and travels a track 172 feet in length. Its big hooks have the unusual lift of 40 feet.

The unusually heavy equipment and special machinery being installed in this up-to-the-minute power station is the largest ever used, which made necessary the designing and building of this great crane.



This great crane was put to a severe test by lifting two enormous power transformers weighted with steel ingots. The crane will be used for heavy lifting in a new electric station.

Modernistic Birdhouses Win Prizes



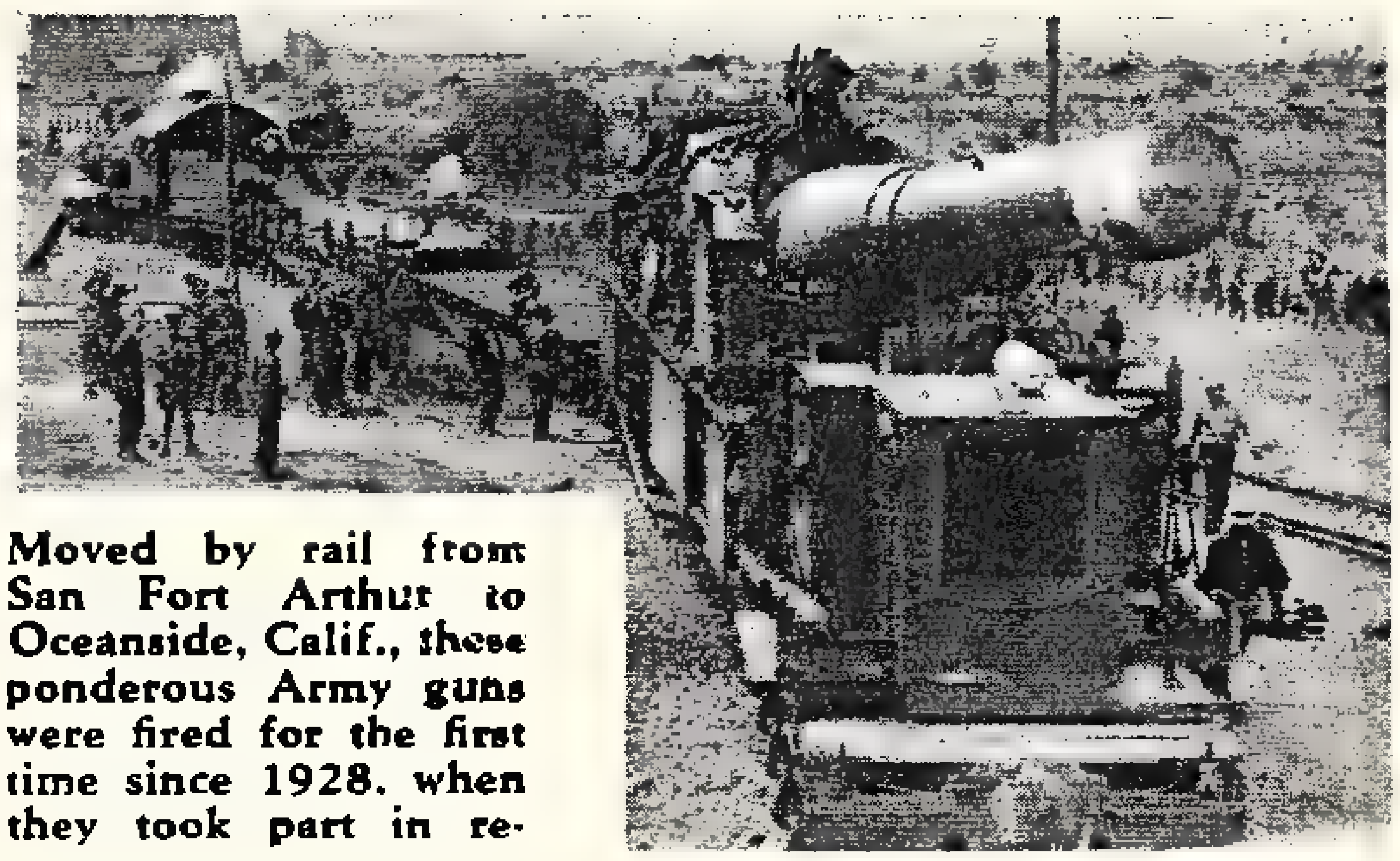
Each of the birdhouses shown represents a different bird classification. In the foreground is a bird bath, while the house showing construction was the largest in the contest.

MODERNISTIC and rustic types marked a recent birdhouse contest of the *Buffalo Evening News*. Class winners included Geo. Fadale, Chester Malachowski, Sherwood Petersdorf, Harry Polarski, C. Gorsky, James Cary, Montrose Hartwick, Daniel Wiertel, Wm. Elsaesser, Fred Vogel and Billie Hughes.

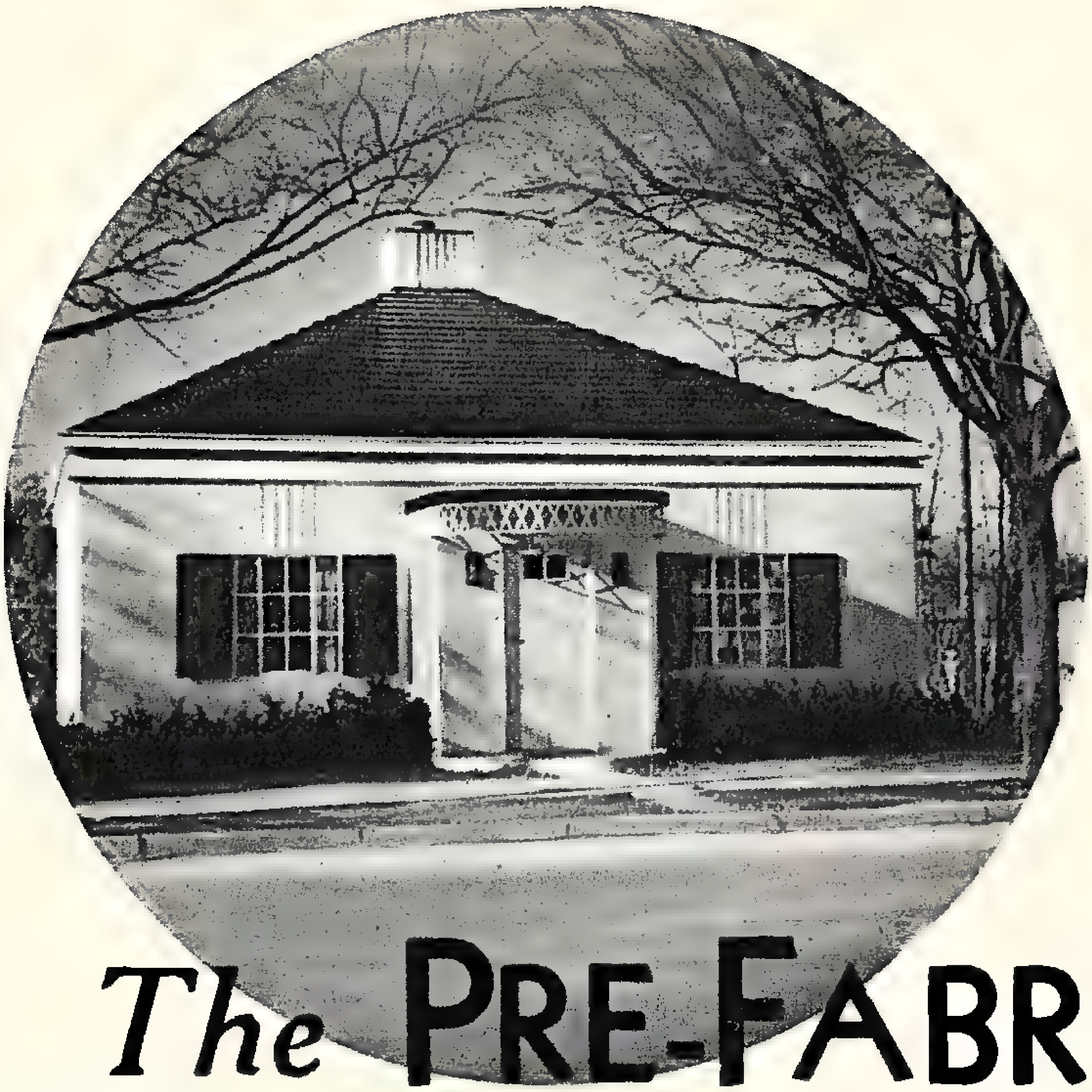
Big Guns Ride To Maneuvers By Rail

EARLY in June, with rails and wheels groaning beneath the weight of 500-ton units, the 14-inch "Big Bertha" Army guns rolled away from their stationary bases at Fort Arthur, near San Pedro, California. They were bound for a coast point near Oceanside, over a hundred miles away.

Later in the month these great guns were fired for the first time in eight years, for they took part in artillery maneuvers and repelled an imaginary enemy twenty-five miles out to sea. This is the maximum range of the 14-inch gun. Where the coastline isn't fortified, concrete bases lie ready to receive the guns in an emergency.



Moved by rail from San Fort Arthur to Oceanside, Calif., these ponderous Army guns were fired for the first time since 1928. when they took part in recent coast maneuvers.



A miracle home, swiftly made and erected by modern Science, is the pre-fabricated house, Industry's most-needed invention for home seekers. Presto! factory-made panels become dream castles. Truly, these pages reflect the creative spirit of America's progress.

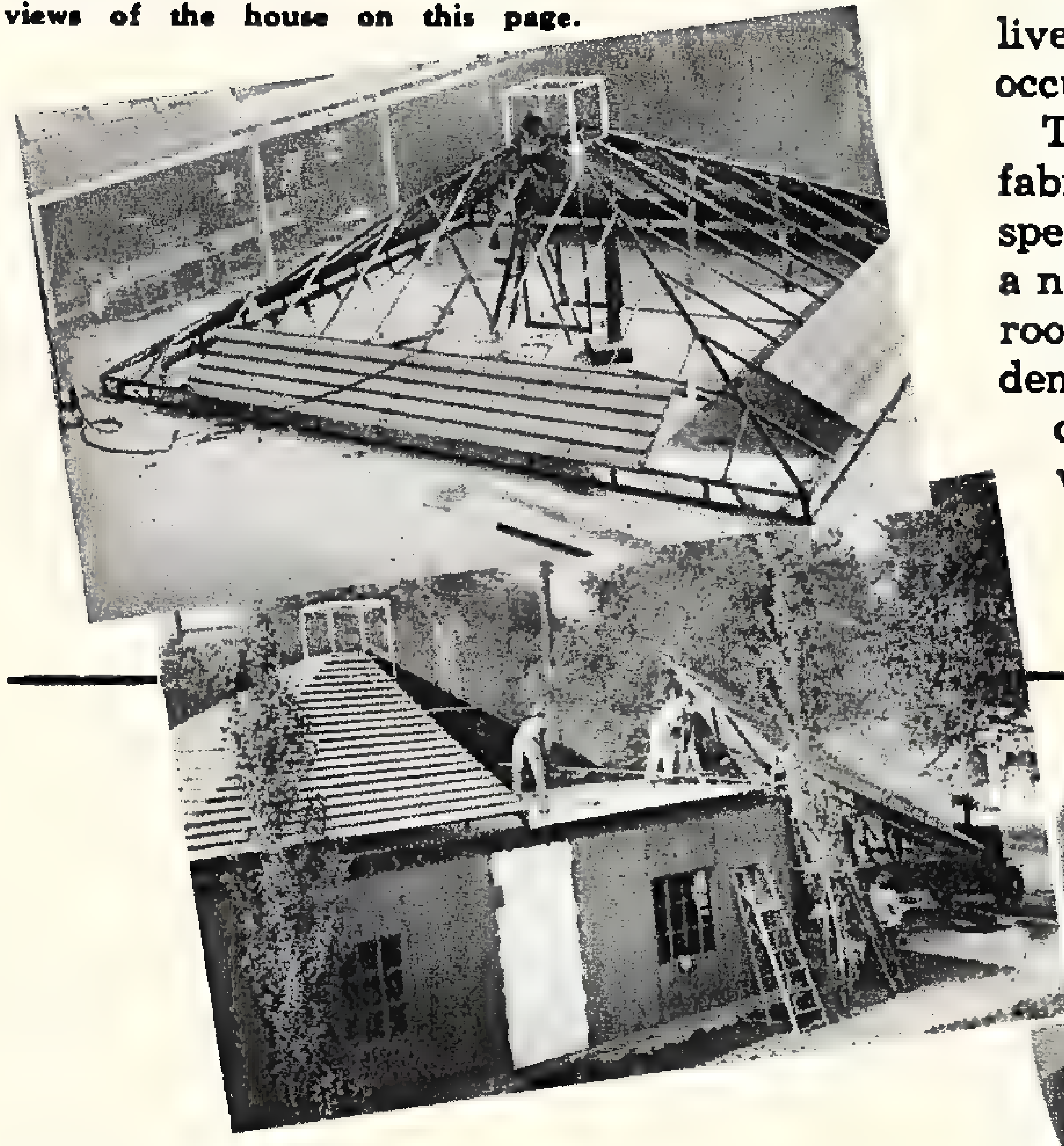
by
DONALD
G. COOLEY

The PRE-FABRICATED

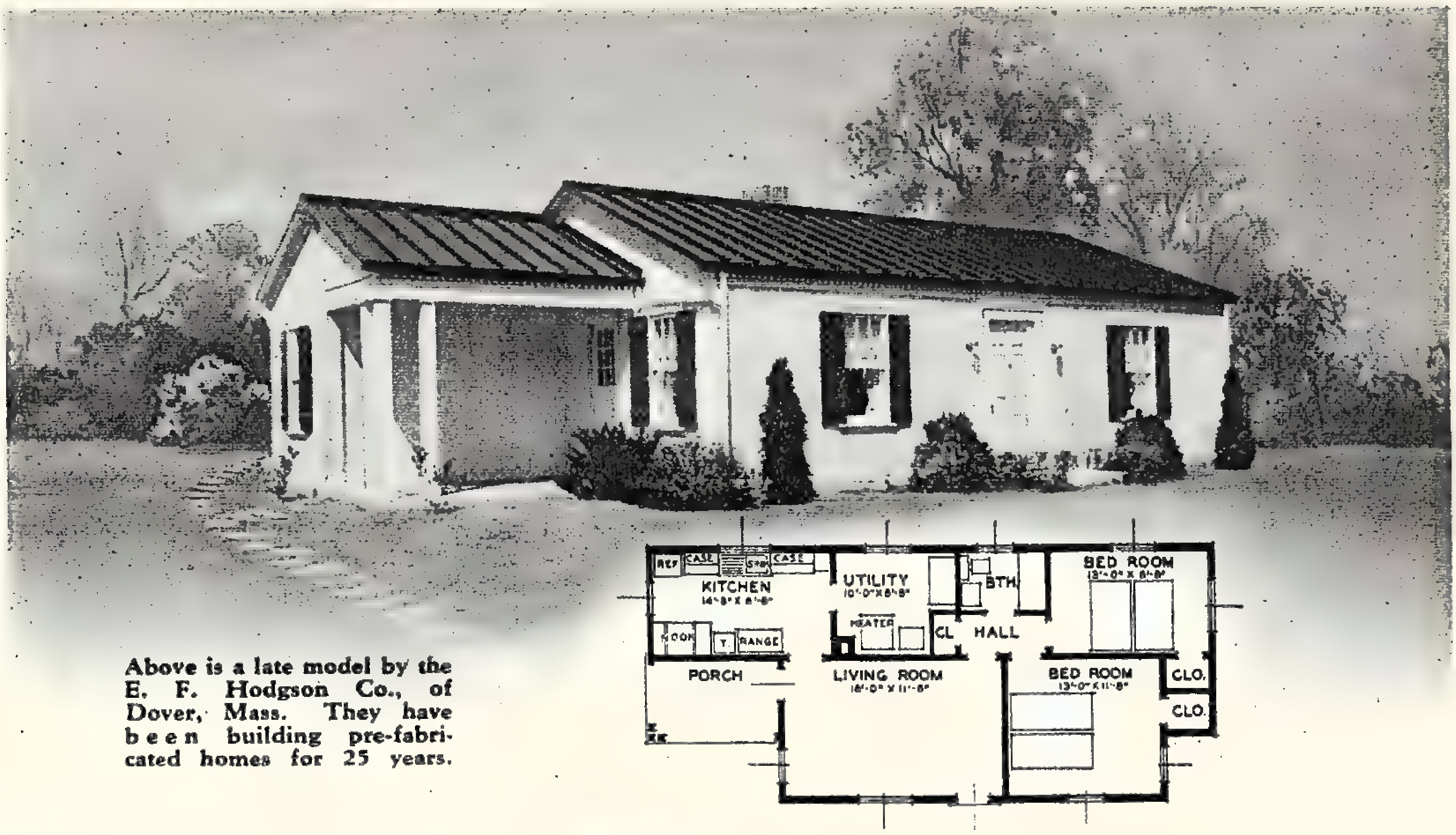
The house above, featured by the Hobart Brothers, of Troy, Ohio, is a 5-room, arc-welded steel house, costing about $3,600. There are other views of the house on this page.

"GIVE me a living room, bath, kitchen and two bedrooms. Wrap them up and deliver them in time to assemble my home for occupancy the first of the month."

The scene is the display room of a pre-fabricated house manufacturer, and the speaker is Mr. Average Man out shopping for a new home. He has just made his choice of rooms from a wide variety displayed on the demonstration floor. The manufacturer will deliver the pre-fabricated units from his warehouse—wrapped in a cellophane



At the factory (see picture over the one just above) the hip roof is arc-welded into four portable sections and shipped by rail or truck. This type of roof gets away from average "box type" house, heretofore so objectionable to builders. Above—The roof portions are lifted from the truck and assembled on top of the house. Circle—Note the artistic layout of the interior of the house and how the living room merges into the dining room without the use of doors. It is a model of simplicity, even to the placing of the glass-topped steel furniture, the mirror and also, the drapes.



Above is a late model by the E. F. Hodgson Co., of Dover, Mass. They have been building pre-fabricated homes for 25 years.

HOUSE ARRIVES

package, if he has a flair for the dramatic—and in a week or two the proud new home owner will be able to step into a marvelously efficient house whose cost is well within the limits of a modest income.

It all sounds like one of those intriguing visions of the future which nobody really expects to come true, but the startling fact is that the day of the packaged house is almost here.

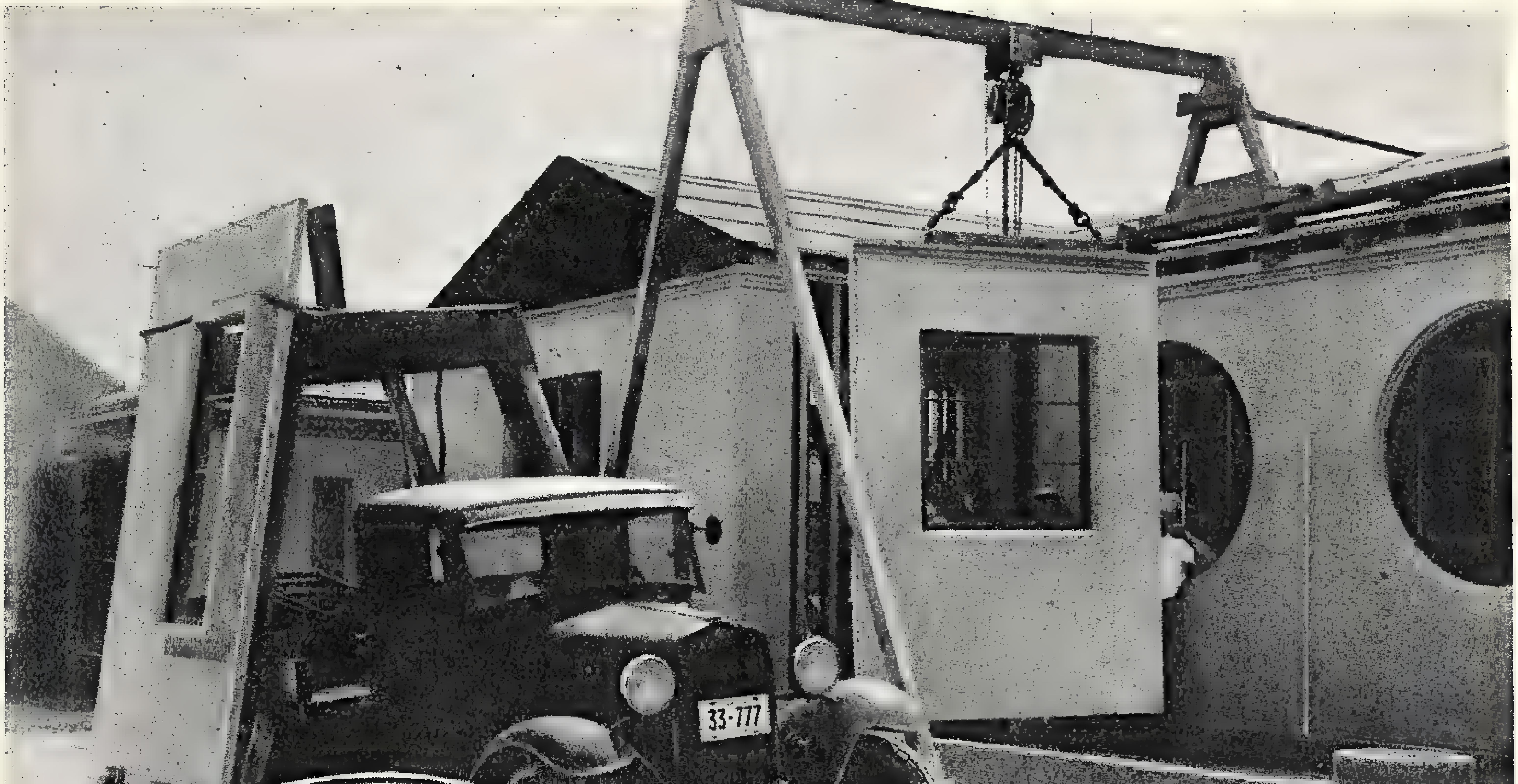
A survey reveals some two dozen companies actively engaged in developing and marketing such houses.

A pre-fabricated house is built up of wall panels turned out in quantity in factories with high-speed machinery. Panels come with doors and windows fitted into them; even plumbing pipes and electric outlets can be built in at the factory. The plumber, electrician, and plasterer are to a large extent eliminated.

What will the pre-fabricated house look

This little dream house in the pines is what many yearn for, and is another artistic model by Hodgson. The owner of an unencumbered lot valued at $1,000 can erect a pre-fabricated house with a cash payment as low as $375, with the remainder at an average rate of $23.53, including fire insurance and taxes.

NEW PACKAGED STRUCTURES CAN



The photograph illustrates how fast the factory-made house can be put together, once the foundation is laid. It shows the simplicity of setting into place a pre-cast panel of Earley Process Mosaic Concrete. Panels are anchored by a novel engineering device that creates a perfect, waterproof structure.

Circle—The house built of copper is rather expensive, but it has the advantage of lasting indefinitely. A blow on the house will not result in a metallic ring, as one would imagine, because insulation between copper walls absorbs the sound.

like when it is unwrapped from its package? There is as yet nothing like a standardized form, and probably never will be, but in general the packaged home will be square-cut, free from gables, turrets and complicated ornaments, modernistic in general outline. Wood will give way almost completely to metal. The framework will be of steel, except where panels are used which supply their own frames.

Walls will be amazingly thin and well insulated, with a corresponding increase in usable floor space. Costly basements will be eliminated. Heating and air-conditioning equipment operates cleanly and silently enough to be placed on the ground floor. Windows will be opened with cranks like those in automobiles. Plaster walls will disappear in favor of metals or processed plastics. The interior arrangement of rooms can even be altered after the house is assembled, for inside partitions have no part in supporting the house. Flat roofs will be generally favored, adapted as sun decks and actually affording an additional outdoor room.

And how much will it all cost? You can buy the pre-fabricated units for a two bedroom, living room, kitchen and store room house for as little as $1,050, and you can range upward to $15,000. In general, what the average man regards as an average house will cost around $4,000 from any one of several pre-fabricators.

The ultimate aim is to supply homes to those family groups who cannot afford more than $2,500 for a house. The Roosevelt administration, actively attacking the pressing problem of low-cost housing, estimates that 90 per cent of our population falls within this

BE ASSEMBLED ON SHORT NOTICE

General Houses, Inc., are pioneers in the development of the pre-fabricated steel panel and steel frame house, which are put together with a socket wrench. They have just introduced new model homes to sell from $2,500 to $5,500. These houses are built in 2-foot sections.

income bracket. A survey of the field shows an amazing variety of structural materials obtainable, all of them fireproof, termite-proof, rainproof, hurricane-proof, vermin-proof, and proof against so many other contingencies you can literally describe your house as being one hundred proof.

Steel, aluminum and other metals will be widely used. Glass will become important, not only for windows but in the form of hollow bricks for translucent walls or interior partitions. The house framework will be of steel, just as in skyscrapers, except in those versions where no skeleton whatever is used. In this category fall pre-cast concrete panels, and channeled steel panels which themselves support the house. One company is experimenting with plastics—the material out of which the caps for toothpaste tubes are pressed—for use as structural panels. Such a house would literally come out of the chemist's test tube!

Already in production is the Motohome of American Houses, Inc., of New York City. This firm turns out a wall panel made of a cement and asbestos mixture compressed into a slab 2¼ inches thick—which is the thickness of the completed wall, since insulation is provided by the panel itself. It is claimed that the panel never requires painting and that ageing in the weather improves it until it reaches a hardness exceeding that of limestone.

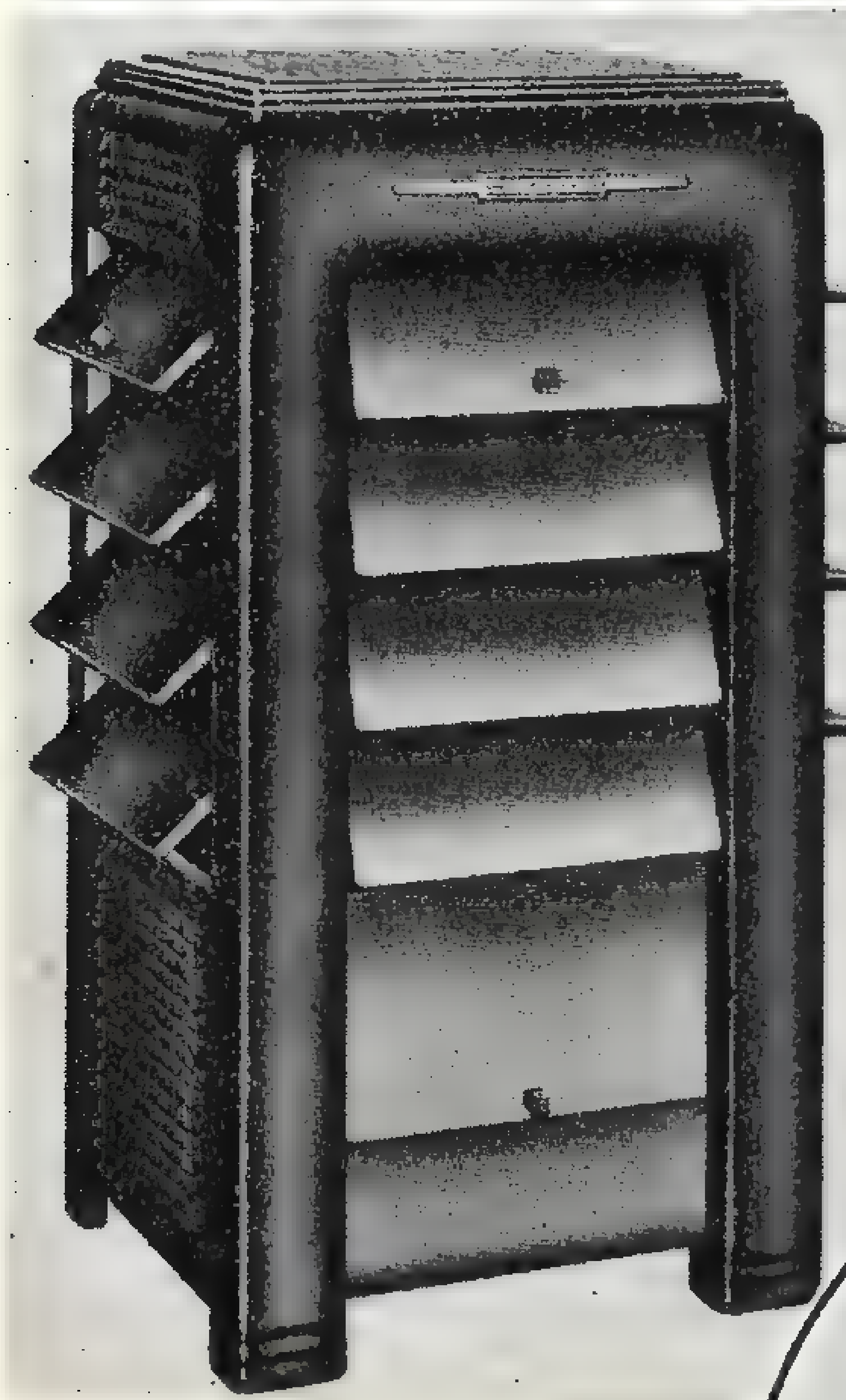
The panels are four feet wide and ten feet high, and come in three standard units—a blank panel, a window panel, and a door panel. These are supported by a steel frame. Spun glass is used beneath the roof for insulation. Cost is said to be 16% less than for the same amount of usable space in traditional-type houses.

National Houses, Inc., also of New York City, uses no frame in its system of pre-fabrication. Sheet steel panels are used for the outer and inner walls, separated by a four-inch space which is packed with a special insulating material known as "vermiculite," which is essentially powdered mica. Four inches of it give the insulating efficiency of a fifty-inch stone wall. The panels are simply bolted together and the exterior surface sprayed with marble dust, giving a fine-grain stucco-like finish of great durability.

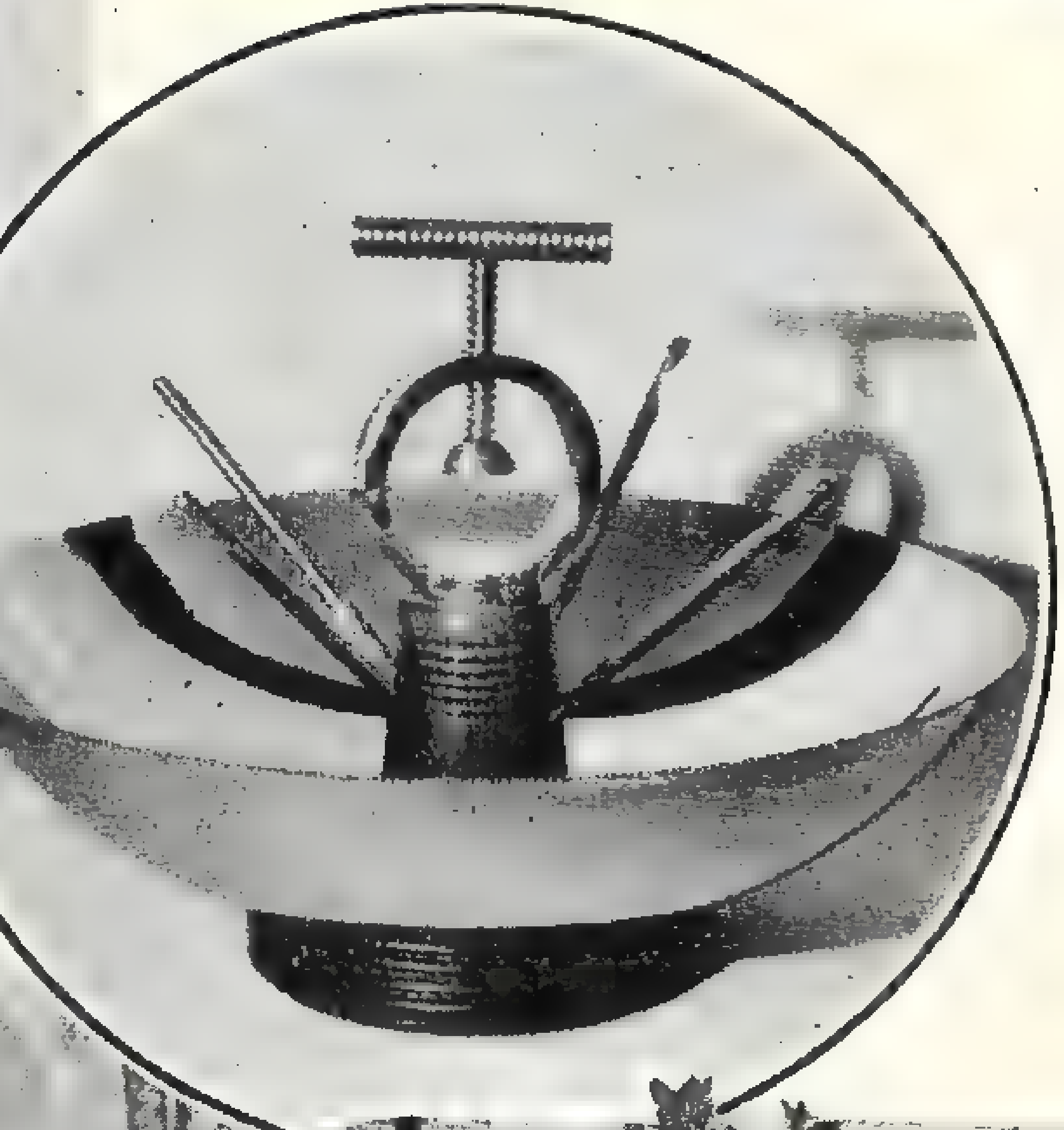
This design was developed by William Van Alen, architect of the Chrysler building in New York, which made history in skyscraper design by having its top 18 stories finished in stainless steel. A four-room National House with garage costs around $4,000, the garage representing $300 of this cost. This company also offers sloping roofs at the option of the

[*Continued on page* 122]

Housewives Inspire Home Improvements



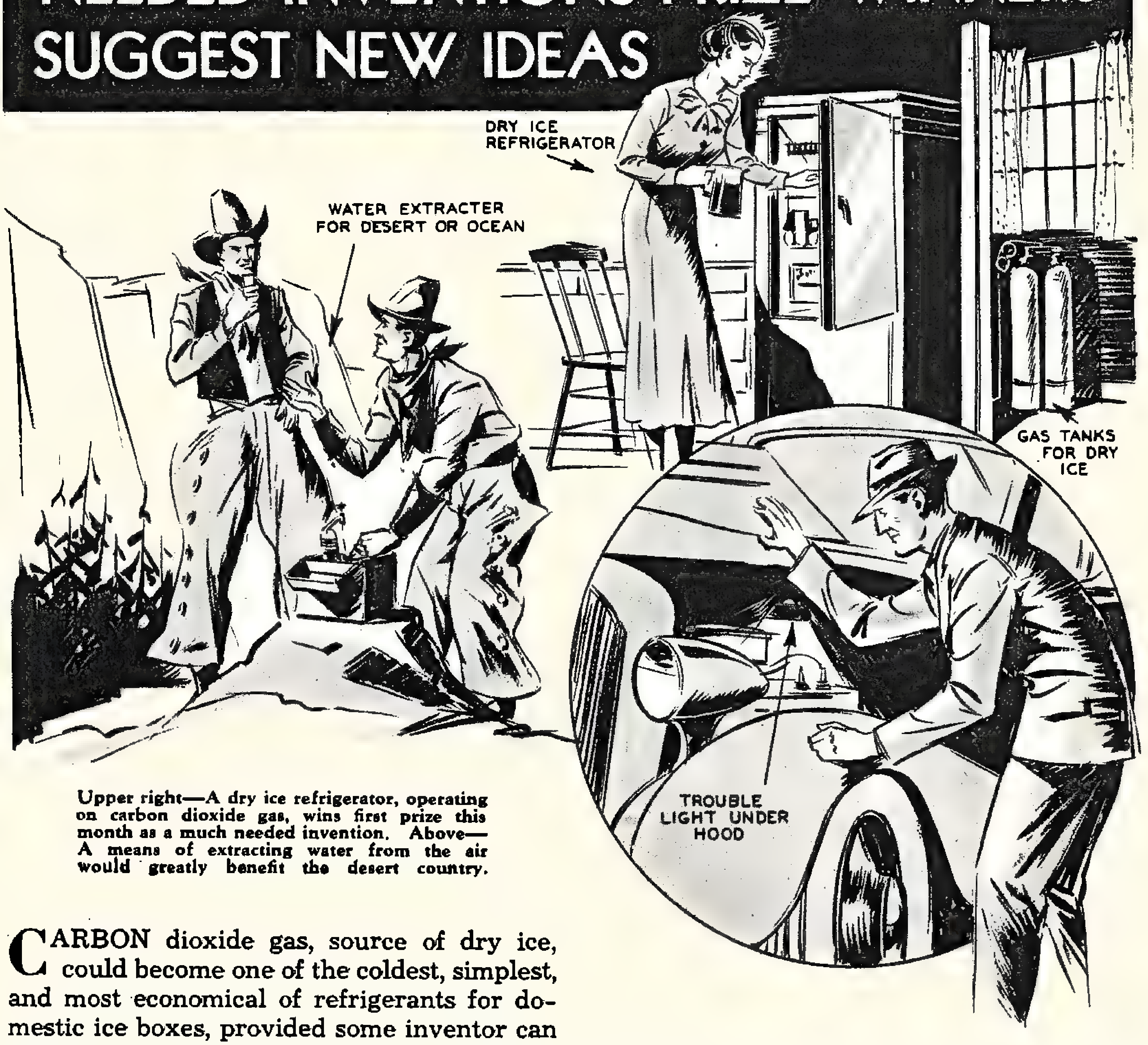
THIS NEW TYPE OIL-BURNING HEATING STOVE, designed to serve as a central heating plant, needs no pipes or flues. With shutters open, it supplies radiating heat, and when closed, heat is circulated through a grille.



A MIXING BOWL made of aluminum is now claiming the title of the "perfect mixing bowl." It is light and equipped with a special handle to afford a secure grip. It has an electro-hardened finish which will not wear down or smudge the batter. Circle—**A CHROMIUM NUT BOWL** on a walnut base makes a handsome gift and a practical household item.

Left—**SAFETY WINDOWS** which can be washed on both sides without leaning out the window are contributing to the reduction of household hazards. The sash is tilted inwards at the midrail and at top. Right—**ICE BOX FLOWERS** with all the characteristics of the natural blossom make novel bouquets for parties. Their vitality is restored when placed in ice box.

NEEDED INVENTIONS PRIZE WINNERS SUGGEST NEW IDEAS


DRY ICE REFRIGERATOR
WATER EXTRACTER FOR DESERT OR OCEAN
GAS TANKS FOR DRY ICE
TROUBLE LIGHT UNDER HOOD

Upper right—A dry ice refrigerator, operating on carbon dioxide gas, wins first prize this month as a much needed invention. Above—A means of extracting water from the air would greatly benefit the desert country.

Motorists will instantly recognize the need for a flood light located beneath the car hood. This idea wins the third prize.

CARBON dioxide gas, source of dry ice, could become one of the coldest, simplest, and most economical of refrigerants for domestic ice boxes, provided some inventor can produce an economical method of compressing the gas for mechanical refrigeration. The gas could be supplied in tanks, much as oxygen is supplied for welding, and released into the ice box as needed. For this suggestion A. G. Wuertz, 315 E. Lambright St., Tampa, Fla., was awarded the first prize of $25 in the monthly Needed Inventions contest. He points out that the advantages of dry ice refrigeration would include lower temperatures, noiseless action, lack of odors, portability, simplicity, and low installation and operation costs. Once perfected, this invention could almost name its own price.

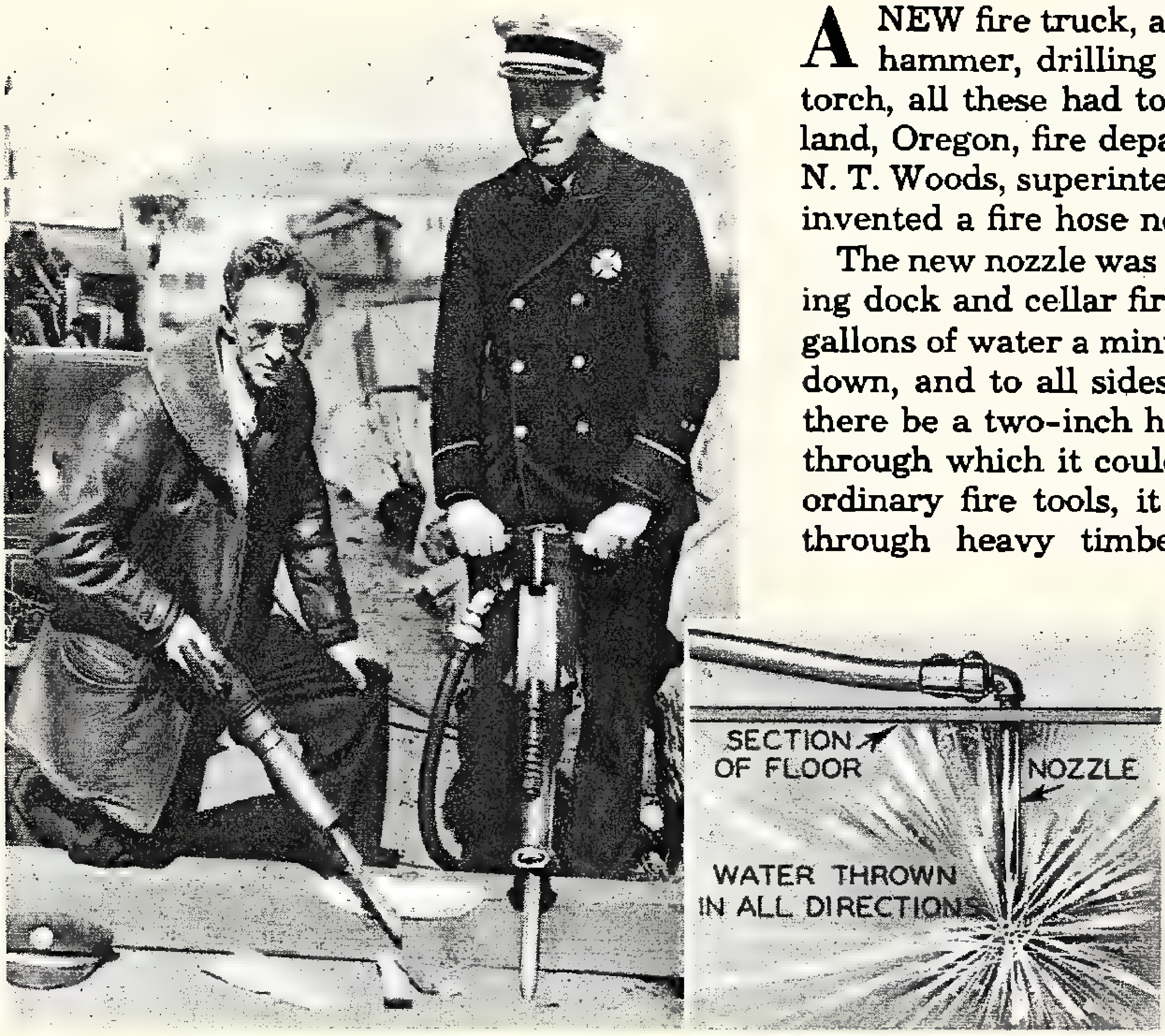
The winner of the second prize, $10 in cash, is C. J. Dyer, 311 S. Division St., Ann Arbor, Mich. Mr. Dyer believes that deliquescent salts, such as calcium chloride, used in connection with a small sun-power boiler and an air-cooled condenser, could be made to extract water from the air in sufficient quantities to make it a vital addition to any desert expedition. The salts, even in the driest countries, will extract moisture from the air. This is vaporized in the solar boiler, and condensed for drinking purposes. As life boat equipment for ocean-going vessels, the salts would not be necessary, ordinary sea water

PRIZES

First Prize	$25.00 in Cash
Second Prize	10.00 in Cash
Third Prize	5.00 in Cash
Three Fourth Prizes	2.00 each
Four Fifth Prizes	1.00 each
Total—10 Prizes	50.00 in Cash

[*Continued on page* 128]

Invents Fire Nozzle; Then Designs Truck To Go With It


SECTION OF FLOOR
NOZZLE
WATER THROWN IN ALL DIRECTIONS

Supt. N. T. Woods, left, and Capt. Grenfell try out the pneumatic wood cutter and concrete driller, two tools necessary in boring through docks and floors. Once the hole is made, the special fire nozzle invented by Wood quickly quenches the fire.

A NEW fire truck, an air compressor, jackhammer, drilling tools and an acetylene torch, all these had to be added to the Portland, Oregon, fire department simply because N. T. Woods, superintendent of fire apparatus, invented a fire hose nozzle.

The new nozzle was highly efficient in fighting dock and cellar fires. It would throw 700 gallons of water a minute in all directions, up, down, and to all sides. But it required that there be a two-inch hole in the dock or floor through which it could be inserted, and with ordinary fire tools, it took too long to chop through heavy timbers, concrete or steel.

Superintendent Woods went to Fire Chief Grenfell with his idea, and together they designed a fire truck to carry the new nozzle, air compressor and cutting tools. A two-inch hole for the nozzle can now be cut through anything from wood to steel in a few minutes.

Poland Vies For Tourist Trade With Luxury Motorliner

Here is Poland's new queen of the seas, the 1600-ton motorliner, the Batory. She is reported one of the finest afloat.

WHILE world-wide attention was being focussed on the Queen Mary, Poland went quietly ahead with the construction of her 16,000-ton luxury motorliner, the Batory. Built in Trieste, Italy, in return for coal from Poland, the Batory is a sister ship of the Pilsudski, Poland's first transatlantic liner since she regained her independence.

The Batory is now plying between New York, Halifax, Copenhagen and Gdynia in the Gdynia America Line service. She crosses to Copenhagen in 8 days, to Gdynia in 8½ days.

Woman Invents Foot Brake Catch

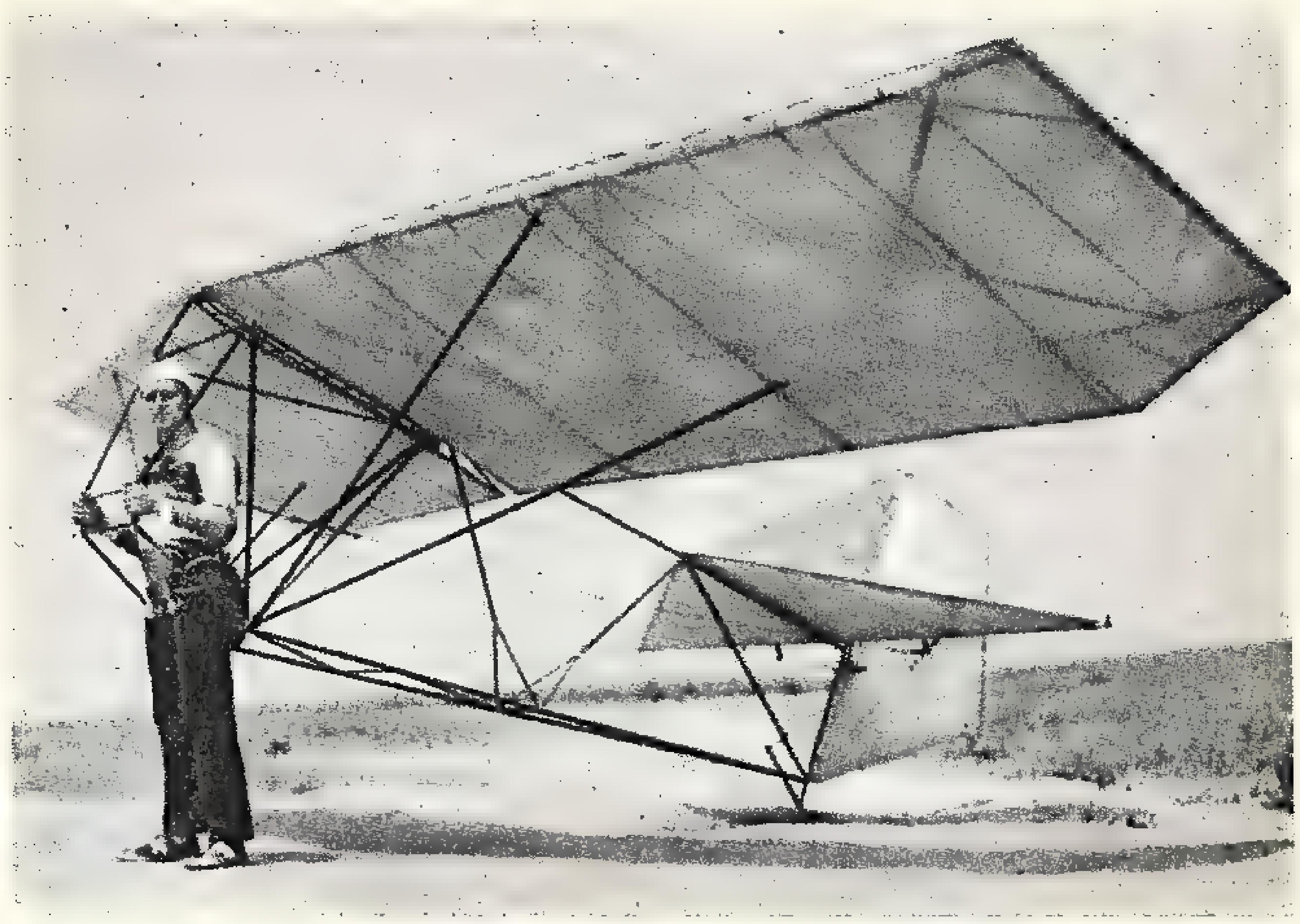
MISS HELEN RANLETT, a graduate of Radcliffe College, is credited with being the only woman to exhibit an invention of her own at a New York Automobile Show. She is the inventor of a brake catch which will hold the car stationary on a hill, leaving the foot free for quick starting. The catch is coordinated with the foot brake.

A Hop, Skip, And Jump Launches 90-Pound Hang-Glider

THE closest approximation to free flight yet to be reached by man has been achieved by Bob Morse, 28-year-old glider pilot, of Rendondo, Cal., with his 90-pound hang-glider.

No motor or launching device is necessary with his glider. Strapping himself into the open nose of the craft, the pilot uses leg power to build up a take-off speed of 15 miles per hour. Once in the air, the glider builds up a flying speed of from 22 to 25 miles per hour.

The glider is the result of four years of experimentation on the part of the inventor. He uses no ailerons and the rudder and elevator controls are worked by cables attached to his body. He serves as his own landing gear.



Here is Bob Morse and his man-powered hang-glider. A run and a jump and the ship is launched. It has a flying speed of 22 miles per hour and is controlled by movements of the pilot's body. No landing gear is needed.

Life Preserver Worn Like Collar

The collar life preserver demonstrated by this young lady is intended for rescue work in rough water. It keeps the victim's head above water, and makes towing an easy process.

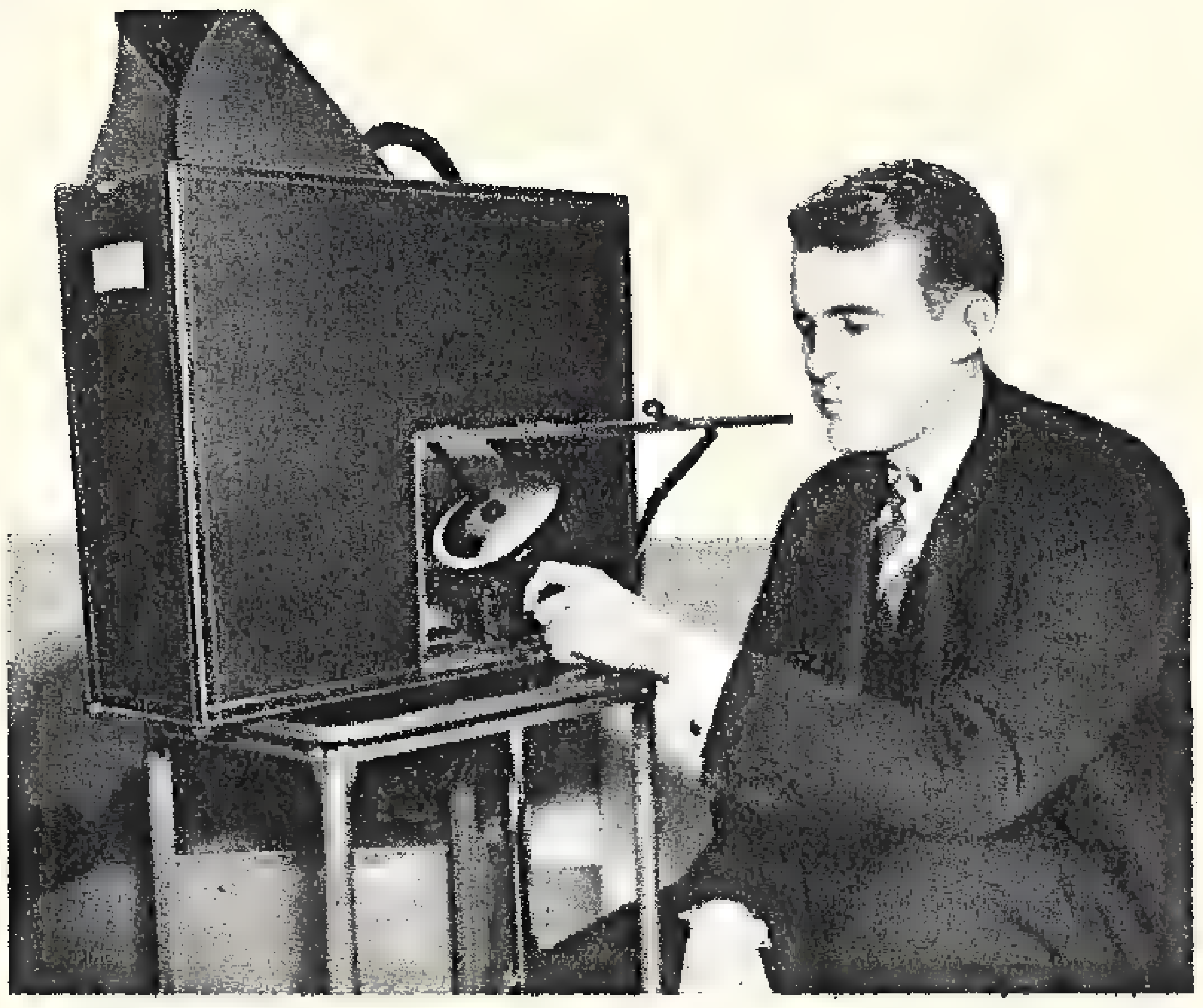
THE difficulty encountered by life guards in saving people from drowning in rough water has been greatly reduced by the use of a new collar life preserver.

The life preserver, which weighs but a few ounces, will support a person indefinitely. It is worn, ready for an emergency, across the back of the life guard. He swims to the victim, attaches the preserver about his neck, and tows him easily to shore. The collar serves to keep water out of the victim's face, and at the same time it is impossible for him to lose his grip. In the event of a major catastrophe, such as the sinking of a boat, a life boat equipped with the collar preservers could supply the victims with the safety devices until additional help arrives.

New Device Sends Color By Wire

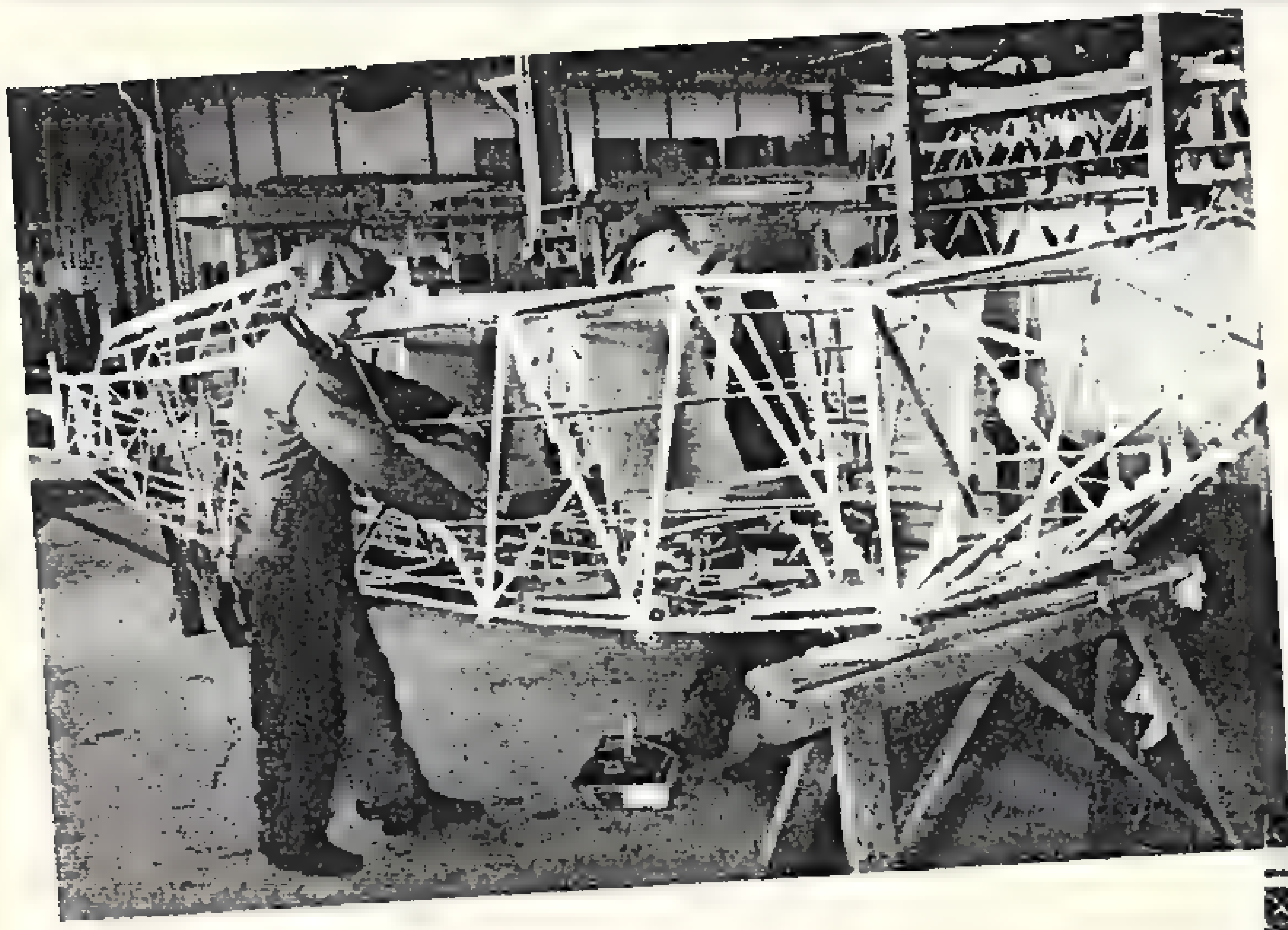
THE transmission of color over telegraph or cable lines has been accomplished after ten years of experimentation by Howard Ketcham, New York color engineer. By means of his simple, inexpensive device color in more than 300,000 shades and variations can be wired to any part of the world.

A three-color card is set to whirling in the device, the colors varying according to its speed. At the other end of the line another card is synchronized with the sender, and a signal is sent when the desired color has been reached. It will be used for industrial purposes.

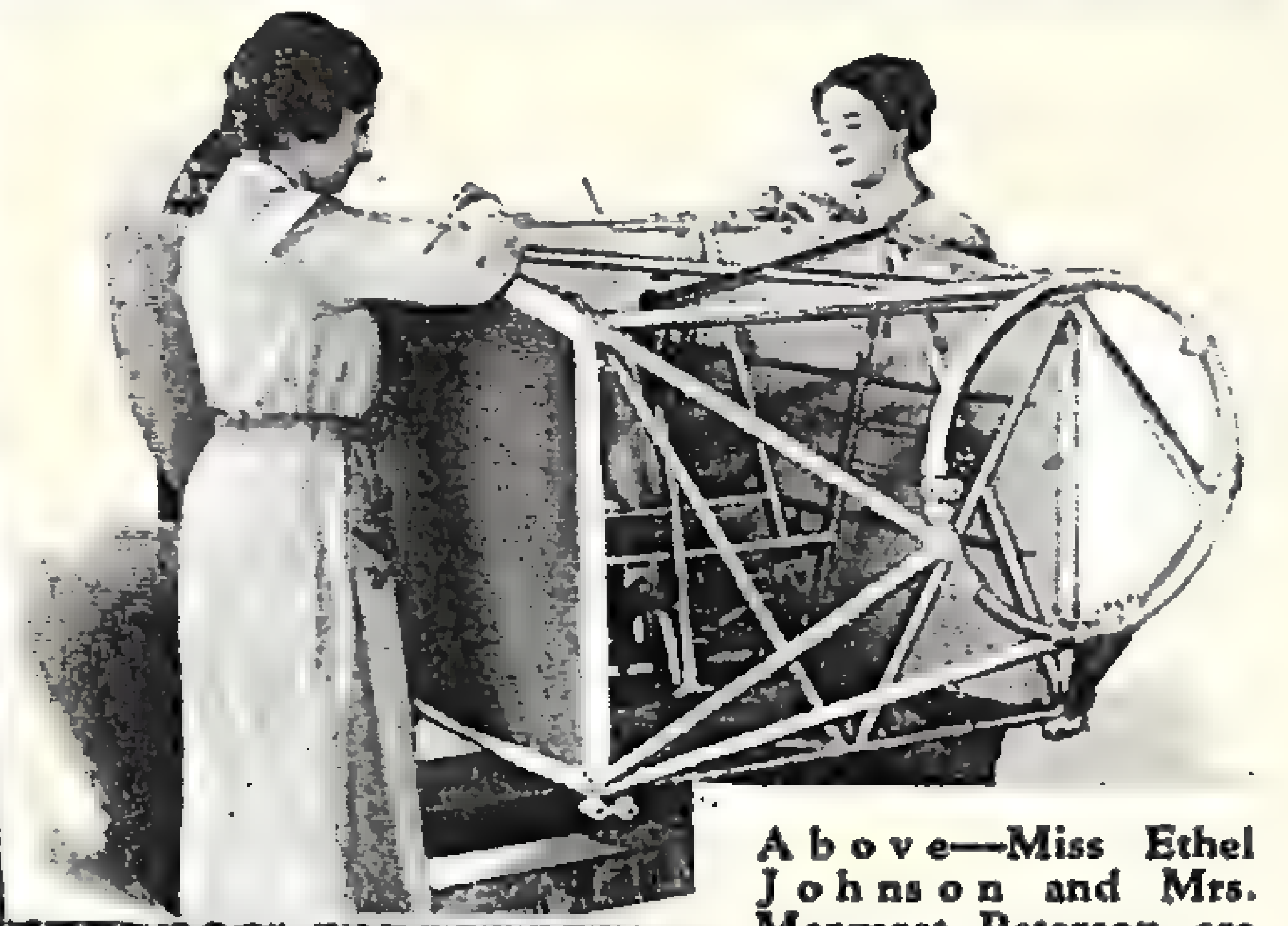


Industrial plants with branches at distant points can now match colors perfectly by wire. Howard Ketcham is shown here with his device for sending colors by telegraph or cable.

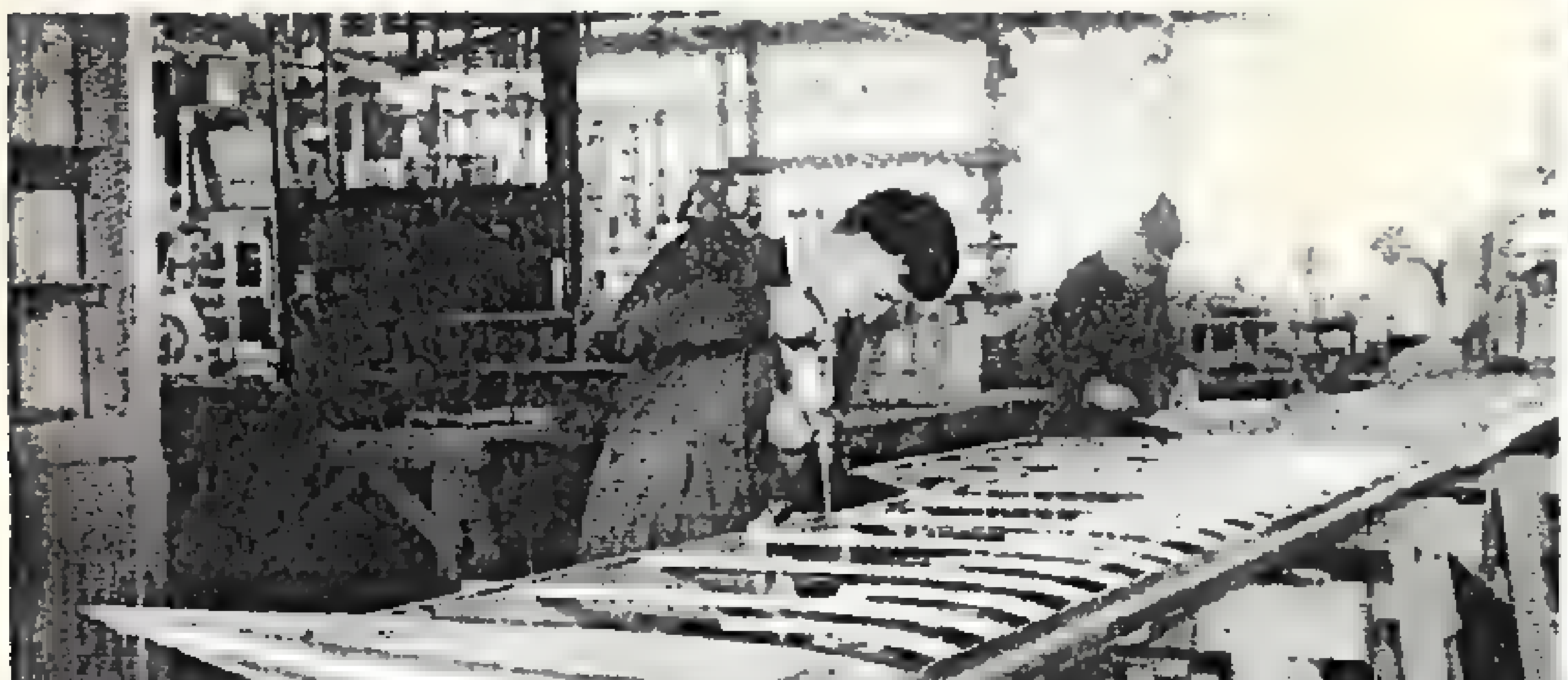
BUILDING PLANES For STUDENT FLIERS



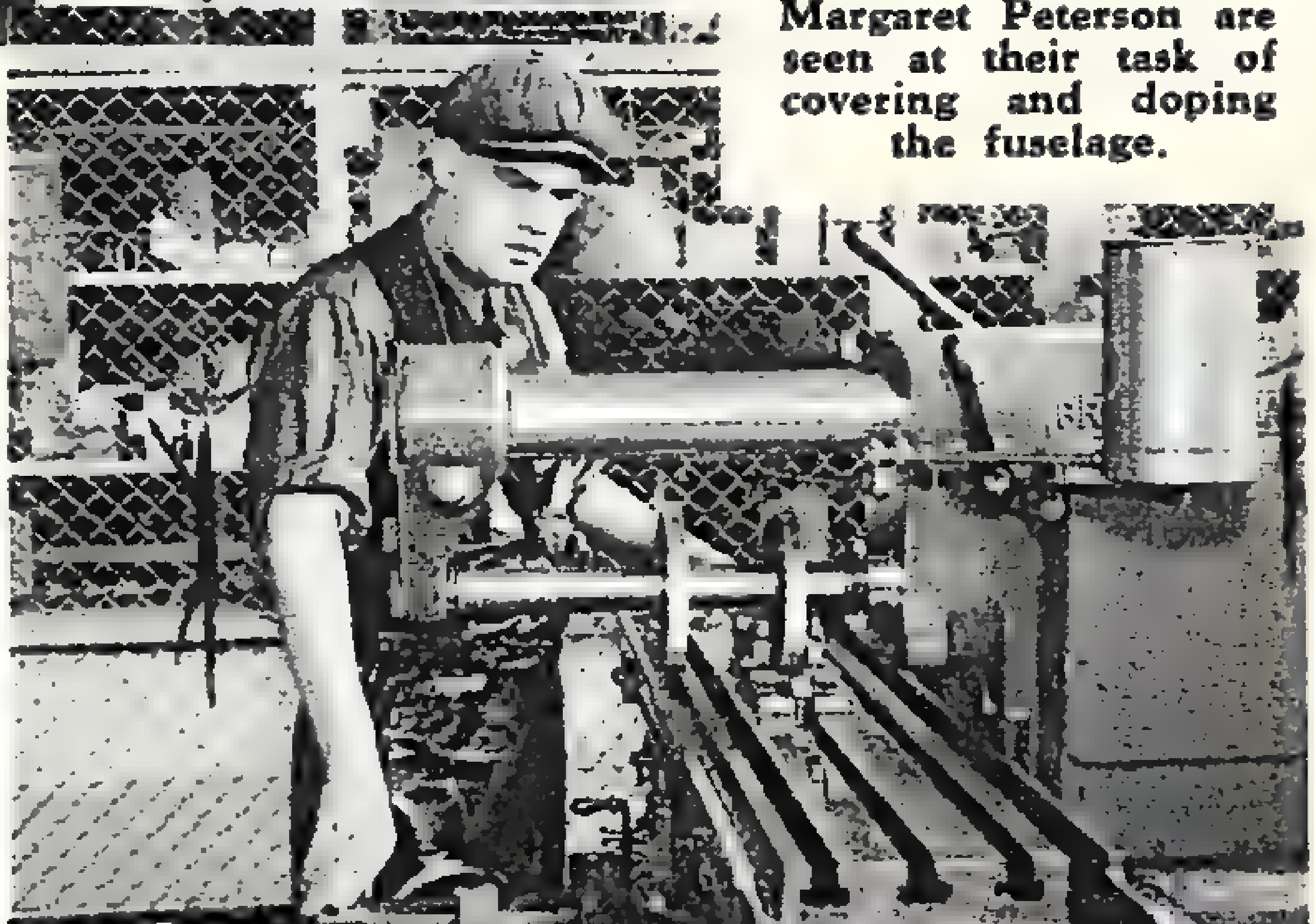
One of the Fleet Trainers under construction in Fort Erie, Ontario. Henry Sawyer and Jack Edgeworth are seen fitting seat into assembled fuselage of plane. *Buffalo Times photos.*

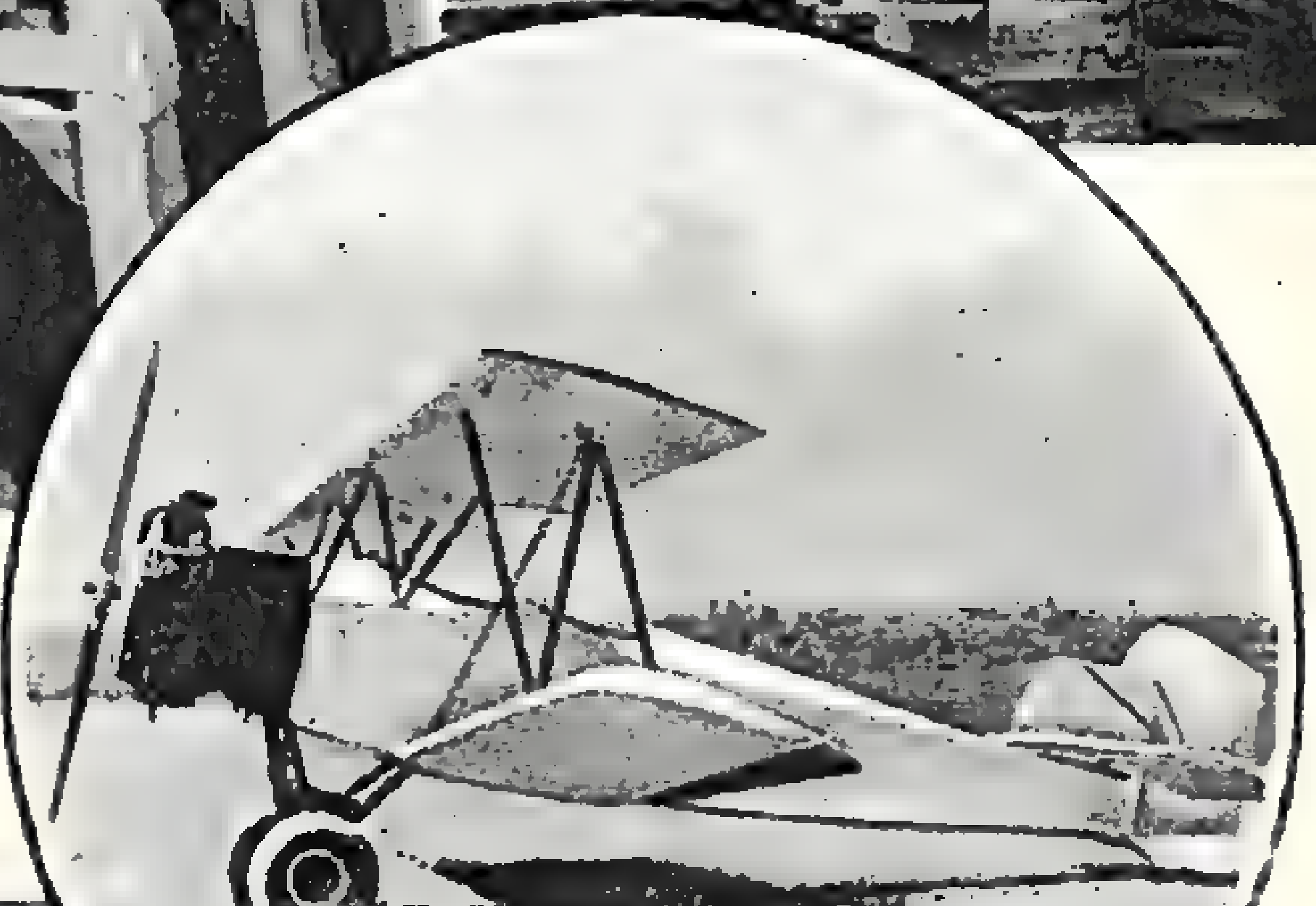


Above—Miss Ethel Johnson and Mrs. Margaret Peterson are seen at their task of covering and doping the fuselage.

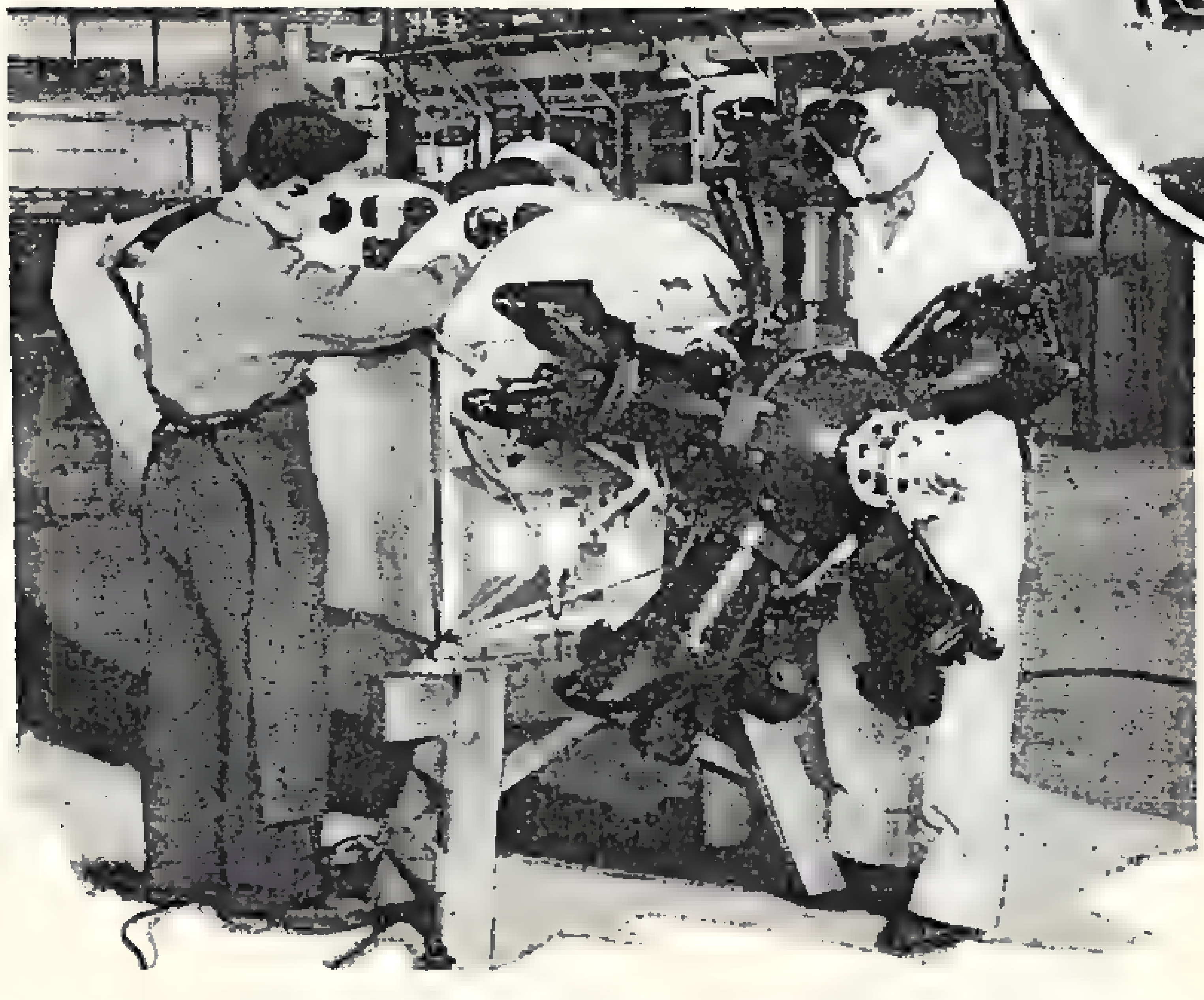


Details of wing construction are pictured here. When the tilerons are to be attached, only a cabinet-maker of John Collingridge's ability is permitted to drill the wings. He is shown in the above photo.





Super-craftsmanship, that is what counts at this plane factory. There is no high-speed production assembly line here, for Victor Wicks machines every metal fitting by hand. When the parts are installed, the fit is exact and accurate, with no lost motion. Left—The finished airplane, sparkling with newness, is wheeled out of the factory and ready for flying tests and shipment.



When the fuselage is constructed, the engine is set into its bed. Then comes the intricate job of instrument installation, which is in the hands of Beverly Brisco and Ivor Elliott. This company makes everything but engines and instruments.

THE Fleet Aircraft Company of Canada, a branch of the American Consolidated Aircraft Corporation, in its factory, builds the Fleet Trainers which are used so roughly by the pilot training instructors of fourteen nations. These planes must stand the gaff of bad landings and faulty air handling, because embryo pilots make many mistakes.

With only slight changes yearly, the planes have been manufactured for a decade. Current models have hoods attached for training in blind flying. Fittings are tooled individually and there is no high-speed assembly line.

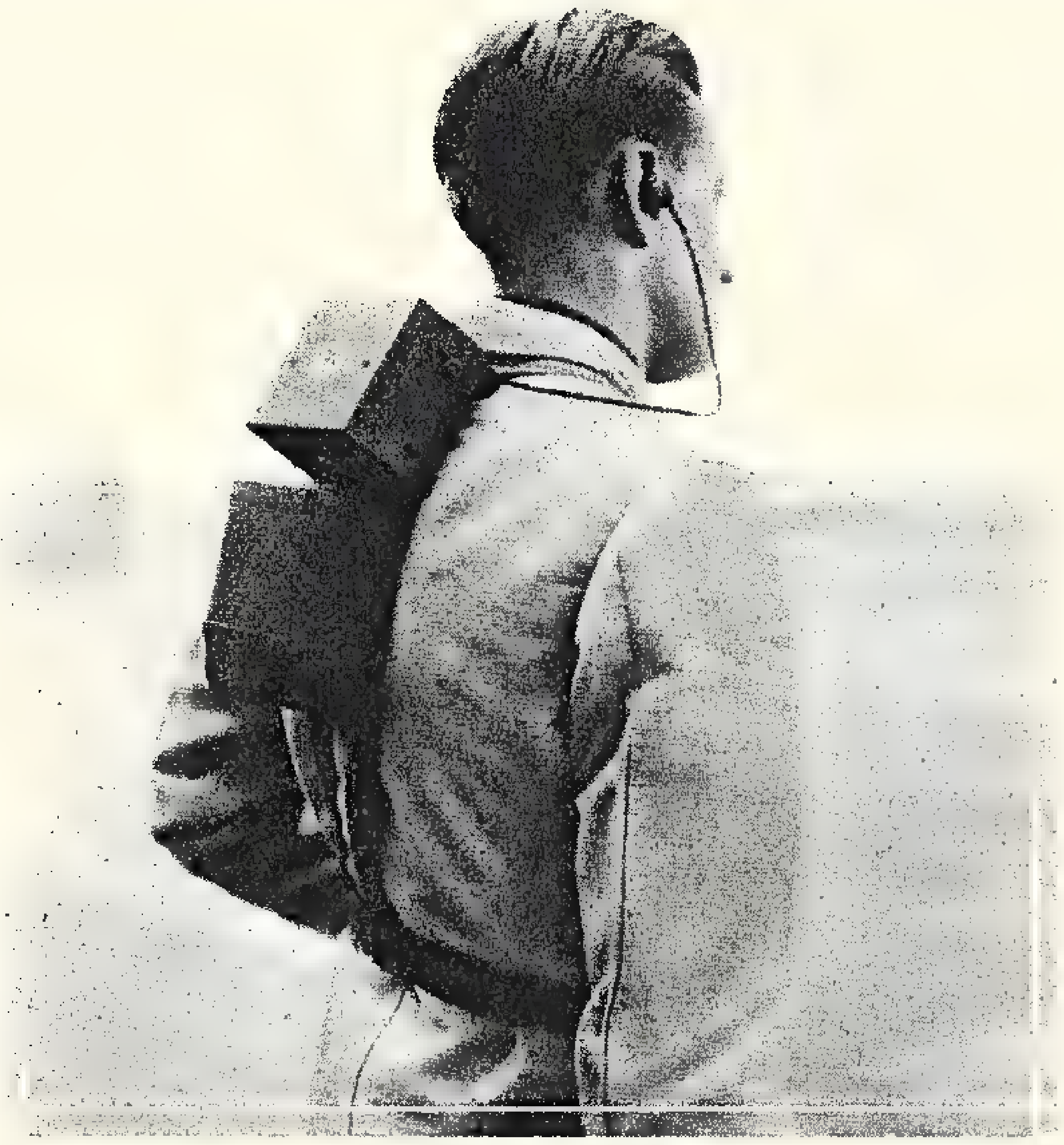
Attic-Raised Silk Worms Forecast $100,000,000 Industry

A $100,000,000 dollar industry, producing nearly a million new jobs, can be brought into the United States with the introduction of silk worm raising, John Ousta, a silk expert from Turkey, believes. As further proof of his claims, he has begun the raising of silk worms in the attic of his home in The Bronx, New York.

At present the United States is importing millions of dollars in raw silk. According to Mr. Ousta, American climatic conditions are more favorable to the raising of silk worm than in either Japan or Turkey. The silk worms he has raised thus far substantiate his claims and produce high quality silk.

Here is what may be the start of a $100,000,000 silk industry in the United States. John Ousta, Turkish silk expert, raises these silk worms in the attic of his New York home. He finds they are healthier than those raised in Japan or Turkey.

Fire Fighters Use Knapsack Radio



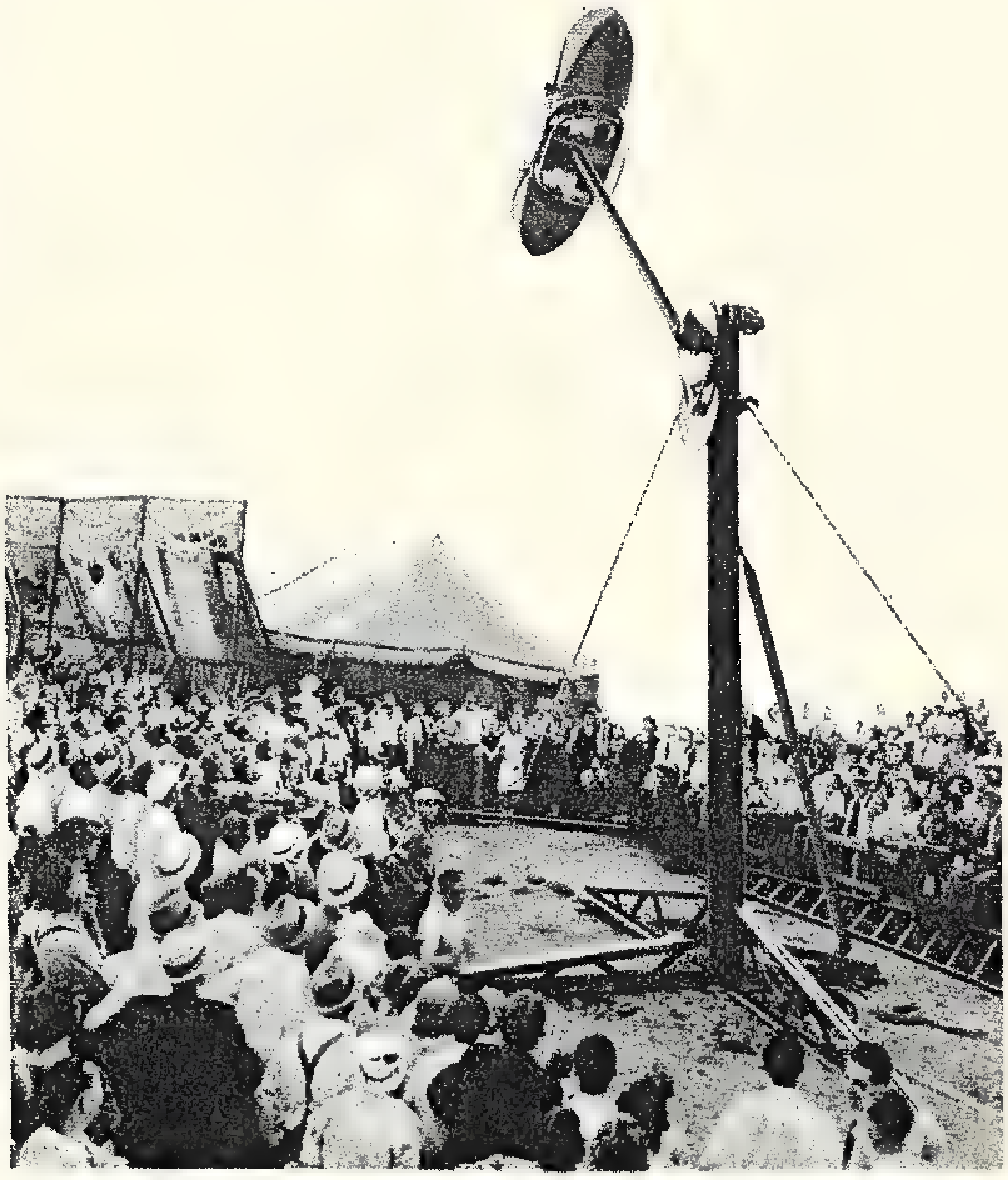
No larger than a soda cracker box, this pack-type radio receiver is designed for emergency work such as mine rescues and fires. Weighing less than 4 lbs., it has a range of several miles.

A KNAPSACK radio receiver, no larger than a soda cracker box and weighing only four pounds, has been designed for use in emergency work such as mine rescues or forest fires when every second saved may mean the difference between life and death.

Using a single tube, the midget receiver has a range of several miles and is equipped with batteries for several hours of continuous reception. The single small ear phone causes no discomfort and allows perfect freedom of motion. In attacking a forest fire, the head ranger, located at some vantage point, can use a small transmitter to direct the work.

New Ride Thriller Loops The Loop

THRILL seekers at county and state fairs, carnivals, and other amusement resorts will this year be offered all the thrills of a test pilot and all the safety of a train ride in the new Loop-o-plane. The new ride whirls its passengers in a giant loop, keeping them all the while securely strapped to their seats. It is six times stronger than necessary.



Looping the loop in a Loop-o-plane, one of the latest thrill rides to make its appearance. It looks and feels daring, but it is perfectly safe, as there is nothing to get out of control.

PLASTICS REVOLUTIONIZE

Out of Test Tubes Come Man-Made Products Smashing Traditional Fabrication Methods and Making Cheaply Available Shining Articles of Surpassing Utility.

An ancient game is now played with pieces of a new material. These chessmen are made of Catalin, one of a score of the new plastics brightening life.

The material beneath the dishes is washable Fabrikoid. The Remington knives have handles of Dupont rubber. The worker below is forcing Catalin into desired forms.

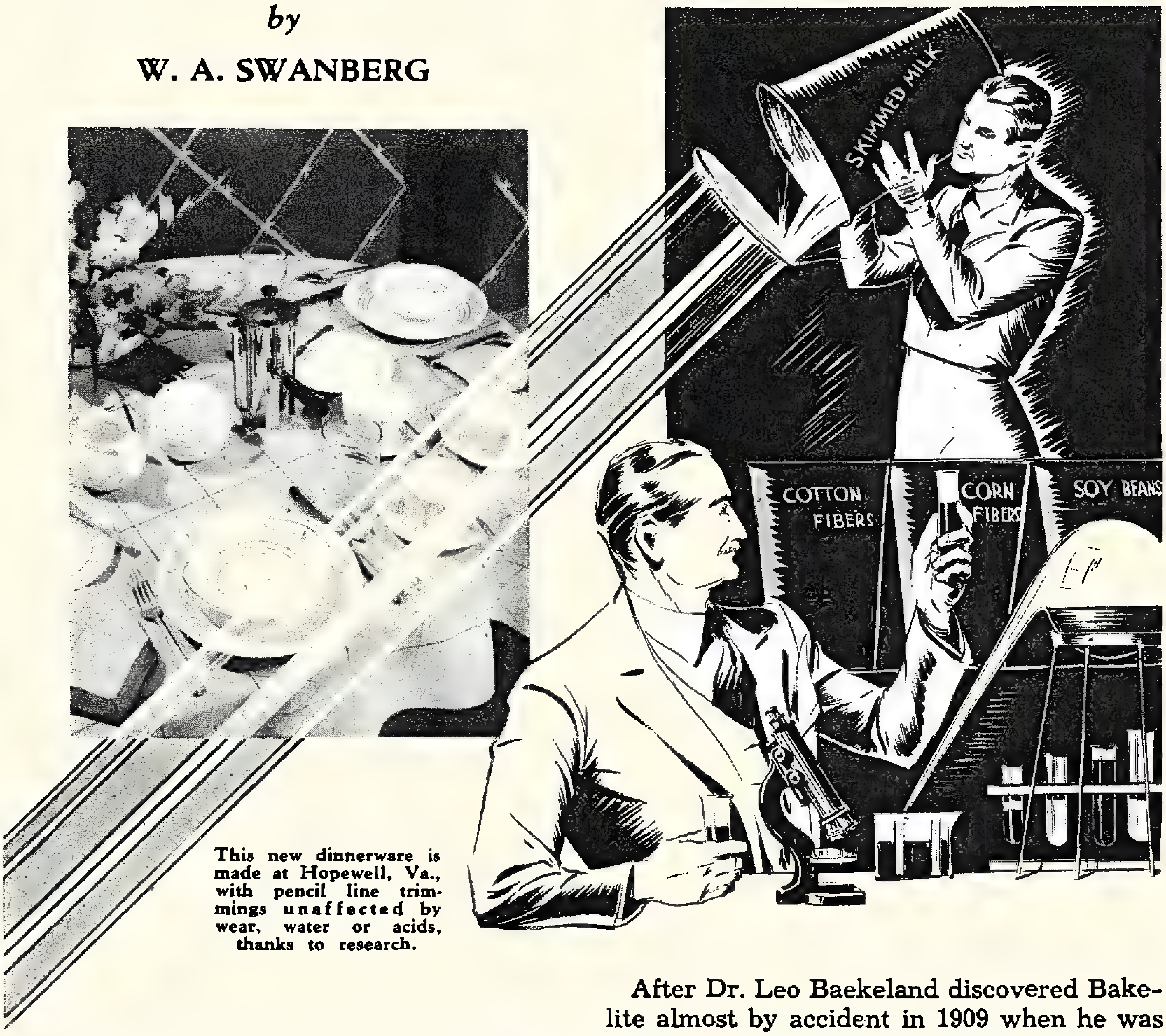
AS THRILLING as any Polar exploration is the day-by-day chemistry in America's laboratories. Here intrepid men with test tubes and beakers forge into the vast uncharted lands of science. More money is spent in this ceaseless venture than was ever dreamed of by Byrd or Stefansson. The cost is reckoned in millions—even, as with radium, in human life—but the gains are worth the battle. For out of this pioneering comes new wonders to revolutionize industry and add comfort and enjoyment to living.

The average American gets up in the morning, switches on the light, shaves, has breakfast, buttons his coat, hops into his car and is off to work. In that short morning hour, usually without realizing it, he has many times made use of a peculiar substance that not so long ago was unknown. That substance is the plastic, a brilliant new child of modern research. The electric light switch is plastic. The razor and its case are probably plastic—as are the handles on the breakfast cutlery, the buttons on the coat, the knobs on the instrument panel of the car. Bright, sturdy and useful articles are all of them—yet they were made

AMERICAN INDUSTRY

by

W. A. SWANBERG



This new dinnerware is made at Hopewell, Va., with pencil line trimmings unaffected by wear, water or acids, thanks to research.

from sour milk, from the fuzz of cottonseeds, from carbolic acid or from thin air. All are recent triumphs of the laboratory.

New as they are, plastics have several decades of history behind them. Celluloid, one of the first widely known plastics, is familiar to all; and Bakelite has long been indispensable in telephonic, electric and radio construction. Yet after these had been on the market for years there sprang a new and versatile aggregation of plastics that brought new moldability and workability, new color and more uses. Though of somewhat different formulae, and suited for different uses, all have two things in common. All are plastic—capable of being molded or cast. And all go through the chemical process known as polymerization, in which the molecules of the substance combine by enlargement of molecular structure.

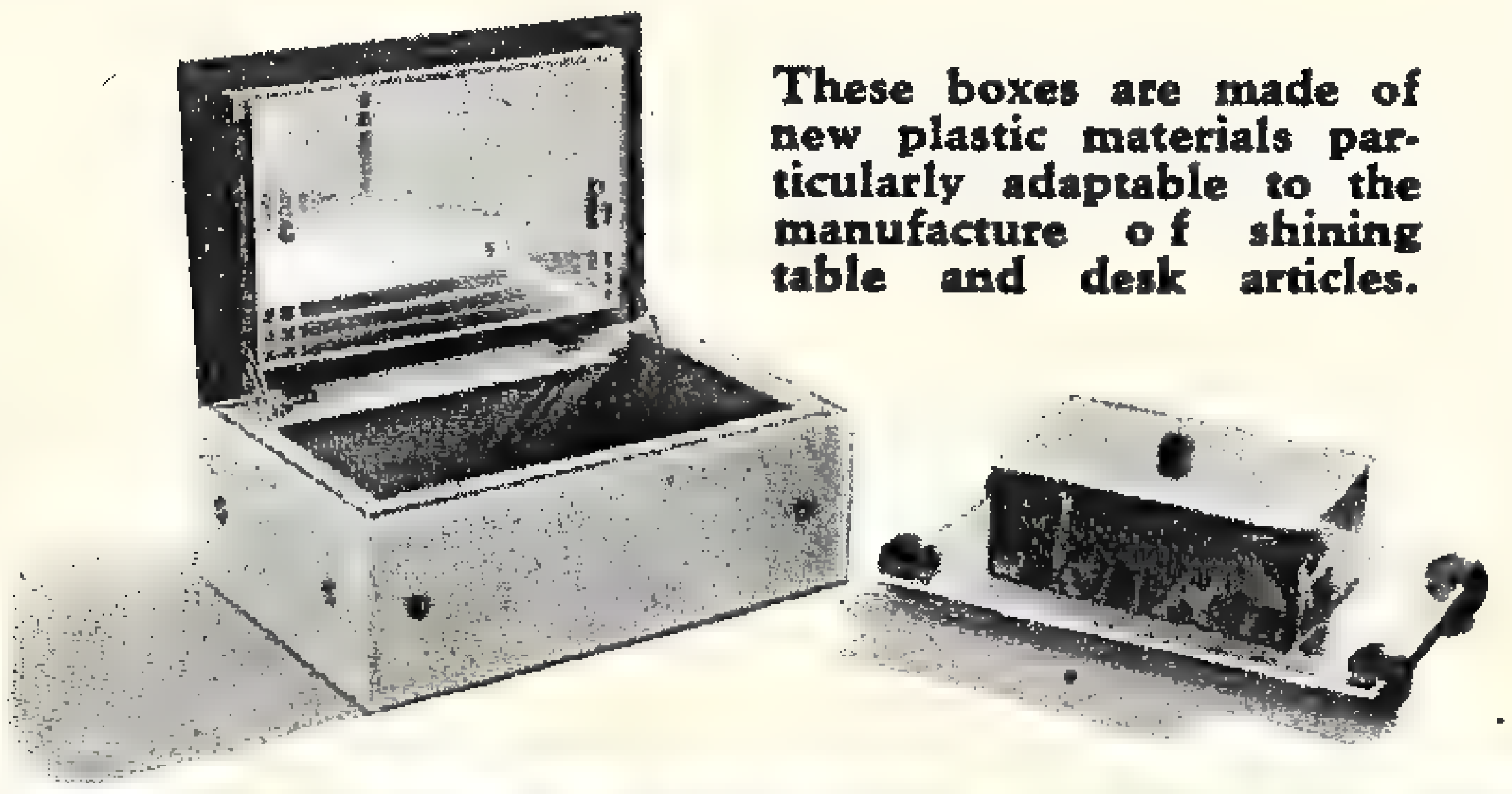
After Dr. Leo Baekeland discovered Bakelite almost by accident in 1909 when he was trying to make a fusible synthetic resin, the creation of new plastics slumped. For years Bakelite and Celluloid were the only important ones used in America, and each had definite limitations. Celluloid, admirable as it was for many uses, was highly inflammable; and Bakelite, despite its utilitarian excellence, could not then come into popular use because of its cost and blackness.

America needed a popular plastic—a substance cheap, fire-resistant, and capable of taking on beautiful colors so that it could be used in the drawing-room as well as the telephone exchange. Not until the last decade did such a product appear.

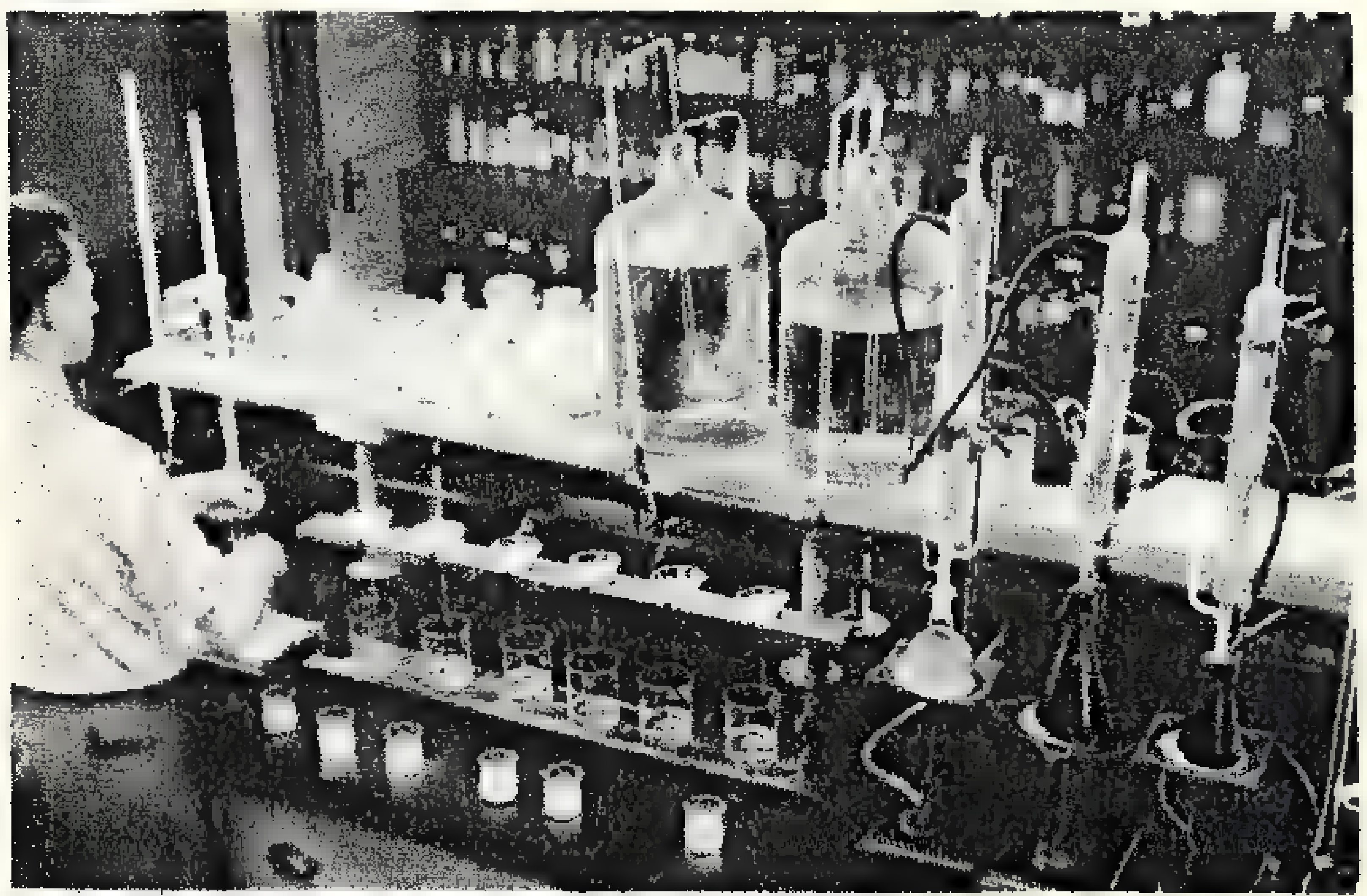
Beetle, Catalin, Durez, Plaskon, Tenite, Resinox, Unyte, and many others—all are new names, all trade names of brilliant plastics made for thousands of uses. Outwardly similar, they are chemically different. Lus-

STARTLING NEW SUBSTANCES

trous, vari-colored Catalin, for instance, cannot take the place of Bakelite in telephone and radio; nor can black Bakelite replace Catalin in the construction of toilet articles and chessmen, where beauty is needed and dialectricity is not. Roughly, plastic can be divided into three groups: Those made from vegetables, from animal, and from mineral matter.



These boxes are made of new plastic materials particularly adaptable to the manufacture of shining table and desk articles.

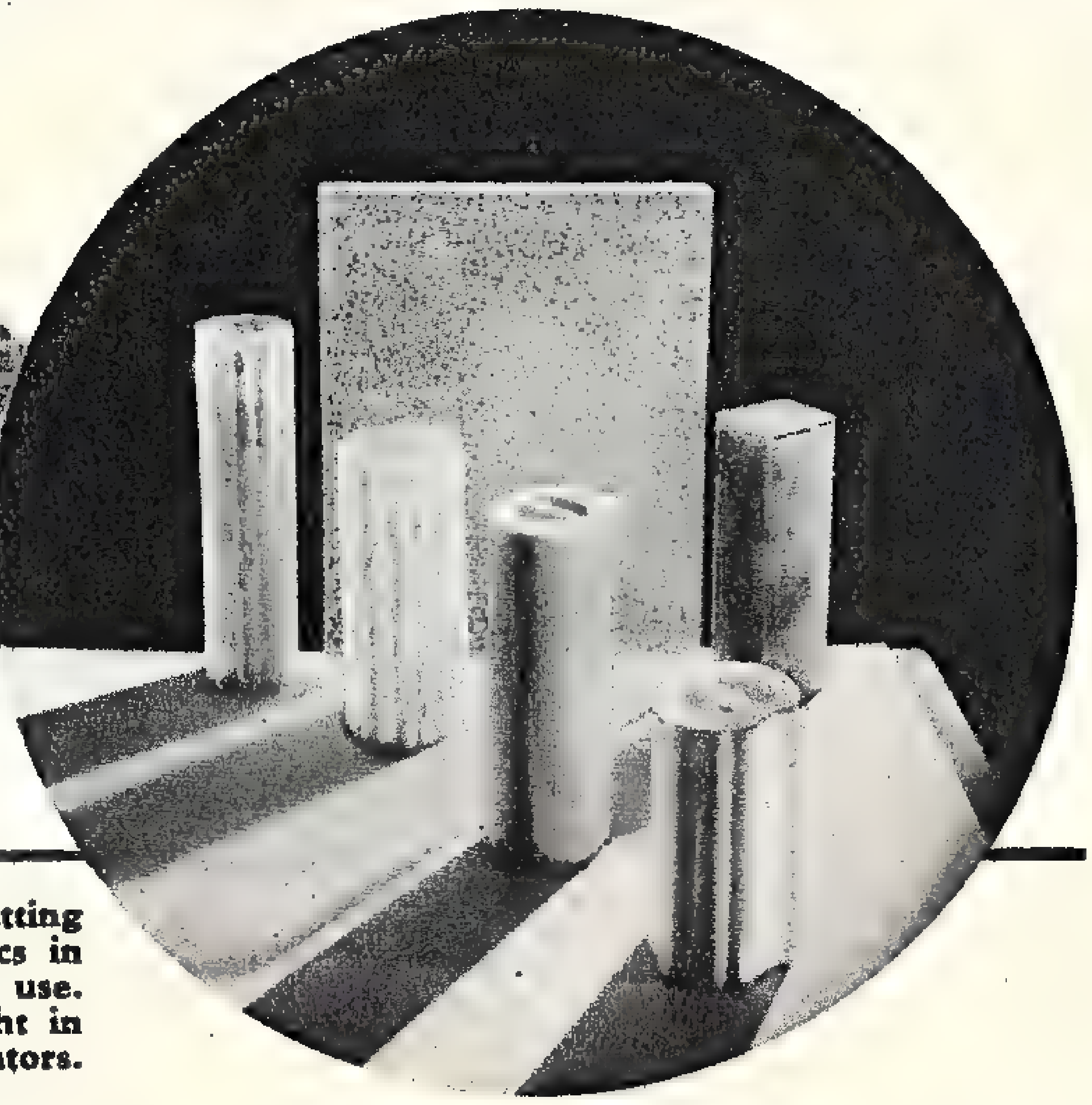


A scene in a research laboratory at Newburgh, N. Y. Chemists conduct endless experiments in their quest for new substances for industry.

Cellulose—the fiber forming the cell wall of all plants, but found in its purest form in cotton—is the old and the new titan in plastics. From this cheap and plentiful vegetable base came the earlier Celluloid; and it now makes Pyralin, Tenite and cellulose acetate. Though it will burn slowly, cellulose acetate is not highly inflammable as was the older Celluloid. Buyers of Cord, Auburn and Hudson cars this year have steering wheels made of this newest plastic. Sheets of Pyralin one-fiftieth of an inch thick are sandwiched between two thin panes of glass to make modern automobile safety glass. And tough, gleaming Tenite now makes thousands of fountain pen barrels, as well as many other semi-transparent things.

It seems a far cry from cow's milk to buttons, yet chemistry has hurdled the distance. America's button industry—a large producer concentrating on a small but vital product—relies largely on milk for its basic material. Casein, made from milk, is chemically combined with formaldehyde to form a lustrous plastic that is giving buttons a more prominent place in wearing apparel.

Mineral plastics are composed chiefly of phenol (carbolic acid) combined with formaldehyde. Of these the well-known Bakelite and a few others are *molded* into desired shapes, are black in color, and therefore are largely restricted for industrial use. Others such as Catalin are made from similar basic materials but are *cast* into sheets, rods and tubes of brilliant



This Fabrikoid table setting shows possibilities of plastics in several phases of household use. Catalin is shown at the right in forms available to fabricators.

REDUCE COSTS IN MANUFACTURING

colors. This bulk stock can be fabricated by cutting or by turning on an ordinary lathe, resulting in colorful cutlery handles, knobs and novelties.

Among the most useful of the phenol plastics is the laminated type, such as Formica, in which canvas or other fabric is pressed into the material for greater strength and insulation. Modern motor cars can thank laminated phenolic formaldehyde for a large degree of their quietness. Gears of this substance have widely supplanted steel because they wear remarkably and do not clatter. In the new ocean giant, Queen Mary, too, is $100,000 worth of decorative material made from fire-resistant American Formica.

One of the newest compounds to startle the market is the urea plastic, a mixture of nitrogen—snatched from the air—with carbon dioxide and formaldehyde. Unlike the others this is manufactured first as a powder and is then molded. Grocery scales made by the Toledo Scale Company used to be housed in cumbrous metal that made them weigh 160 pounds. The company substituted Plaskon, a urea plastic, for its metal housings; in so doing it reduced the weight of the scales to 55 pounds and trebled its sales!

Industrial war is the inevitable result of a successful new material. When one considers that many industrial units formerly made of several pieces of metal bolted together can now be molded in one piece of plastic, thus saving the cost of assembly and painting, the answer is obvious.

Yet there are many uses which plastics cannot as yet fill, because of mechanical limitations. Will research remedy that by

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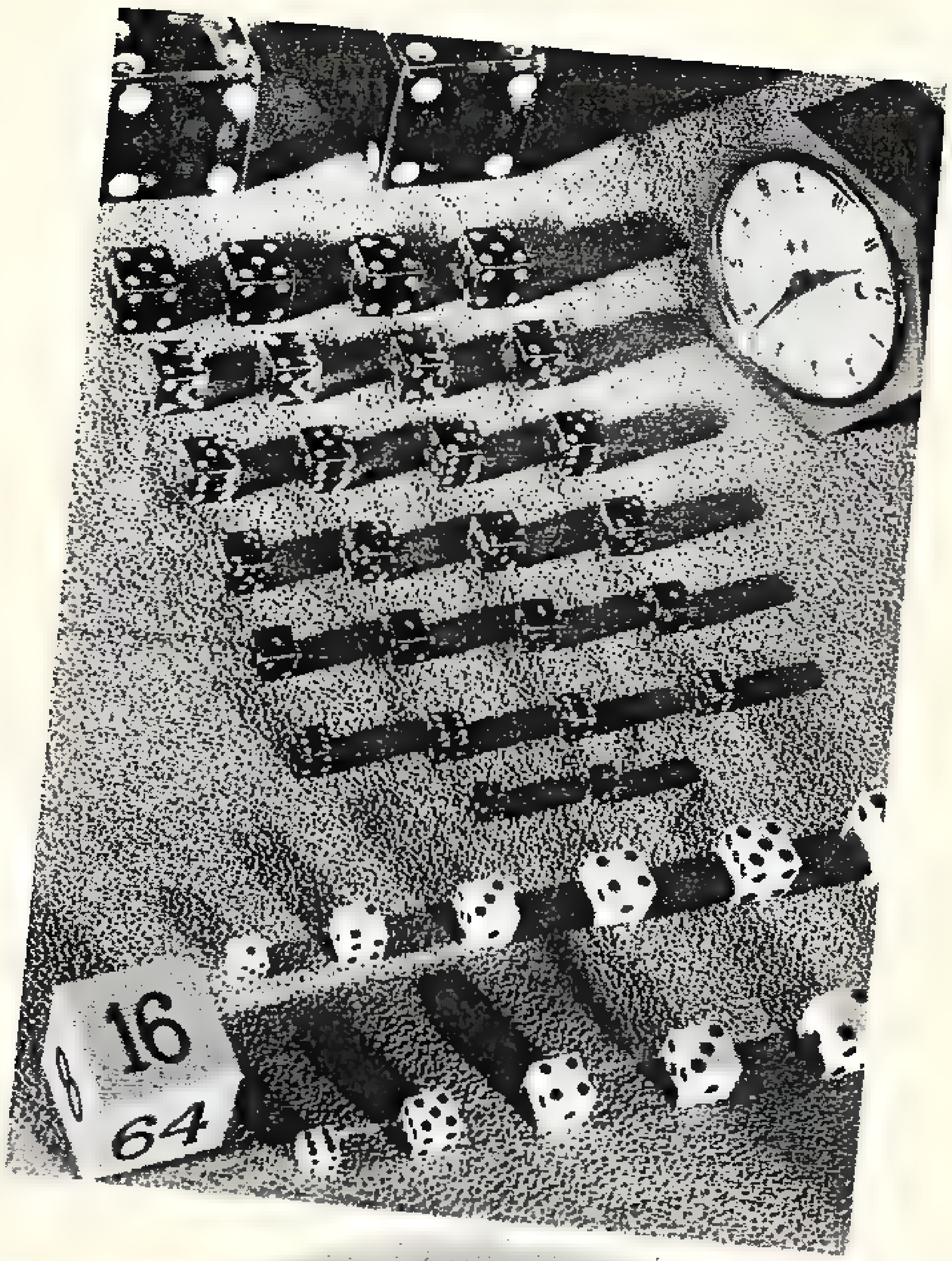
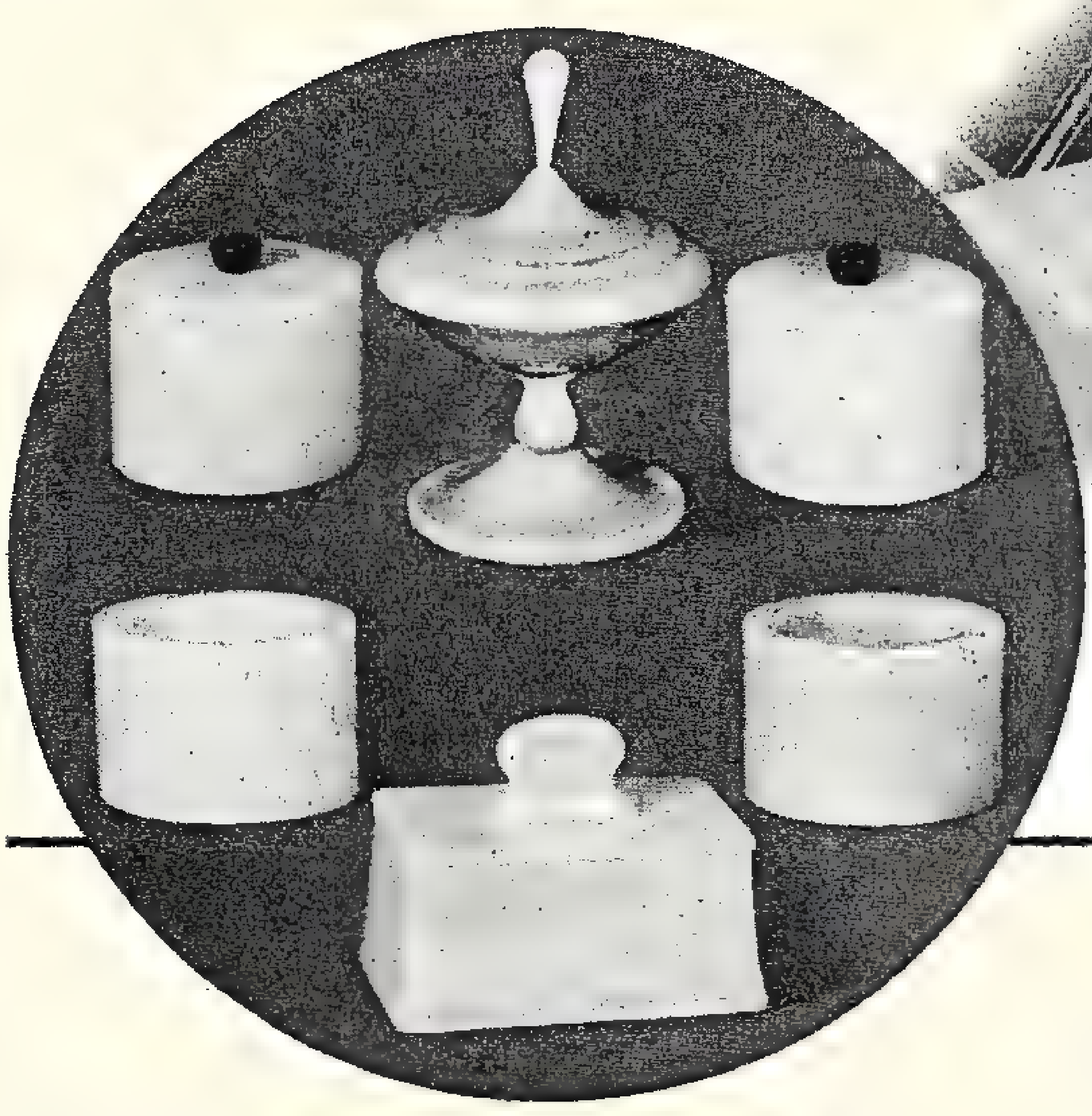
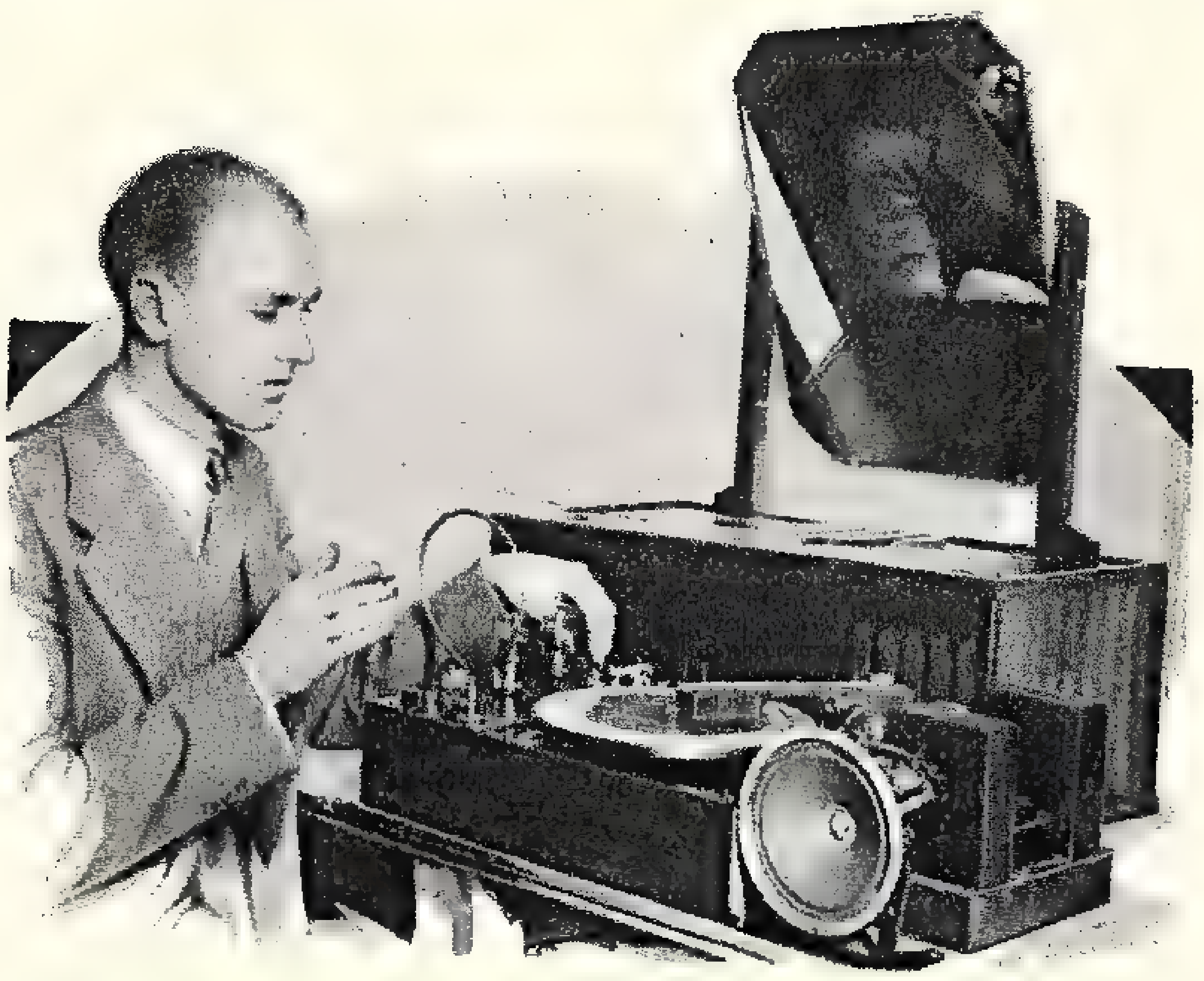


Playtime gadgets of Catalin are shown at the right. They are made of synthetic resin, now widely used in manufacturing. A solution of phenol and formaldehyde is ovencured and shaped.



Toilet articles of Catalin are pictured at the left. The table cloth is made of silver-white and sapphire-blue cellophane.

Mirror Delivers Sales Talk To All Who Pause Before It



Anyone pausing to inspect himself before this mirror is rewarded with a sales talk delivered by automatic phonograph shown in the foreground. An electric eye starts the machine.

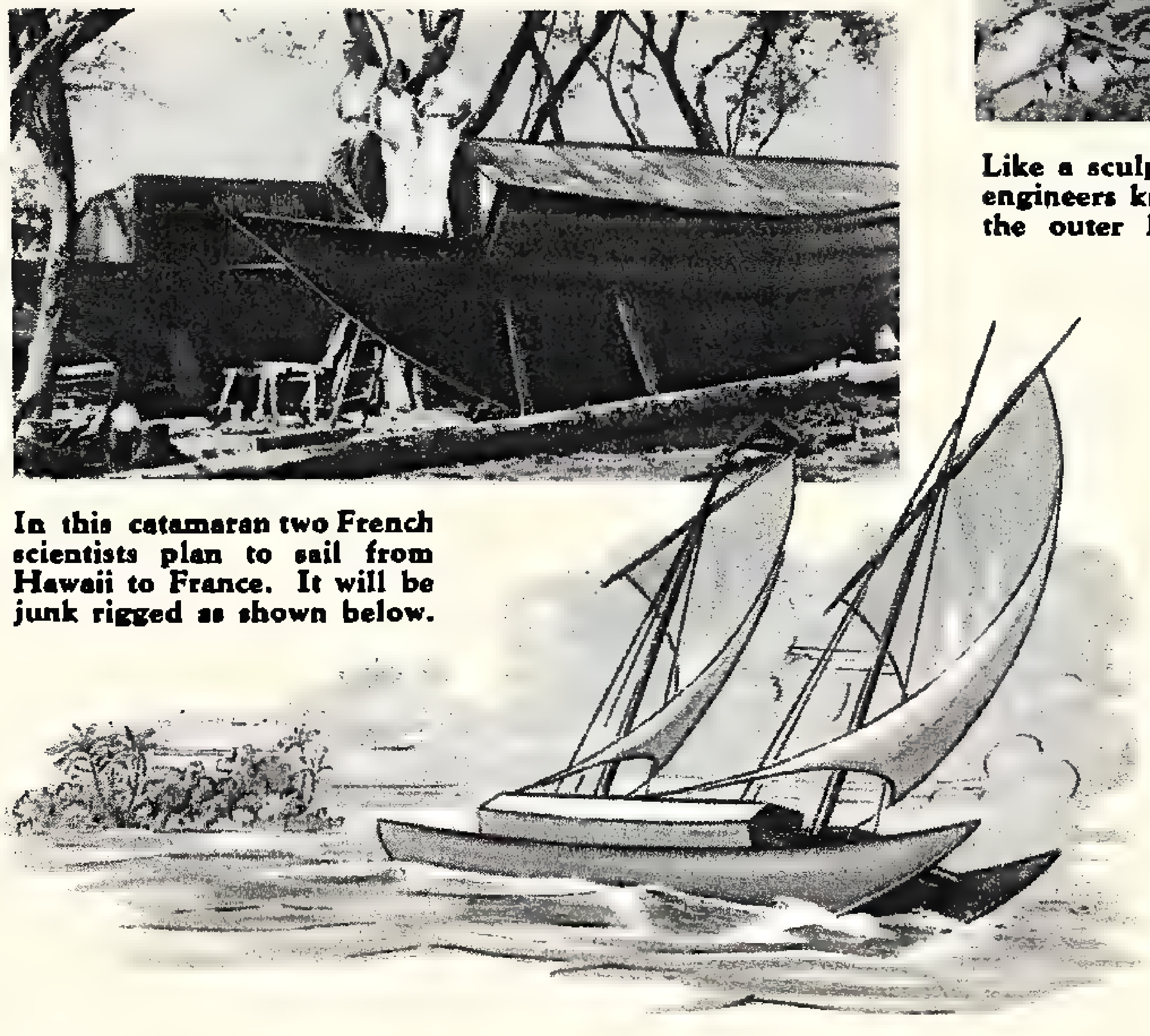
THE universal appeal of the mirror has long been recognized by advertising men as an effective medium for attracting attention to their message but it was left to an enterprising inventor to perfect the talking mirror. With his device the mirror delivers a sales talk the moment someone pauses before it.

The talking mirror is intended for installation in department stores, but it can be used outside with equal effectiveness. An electric relay system swings into operation the moment anyone interrupts an electric eye to scan himself in the innocent appearing mirror. The relay starts an automatic phonograph and amplifier and a brief sales talk is delivered.

Marooned Men Build Catamaran

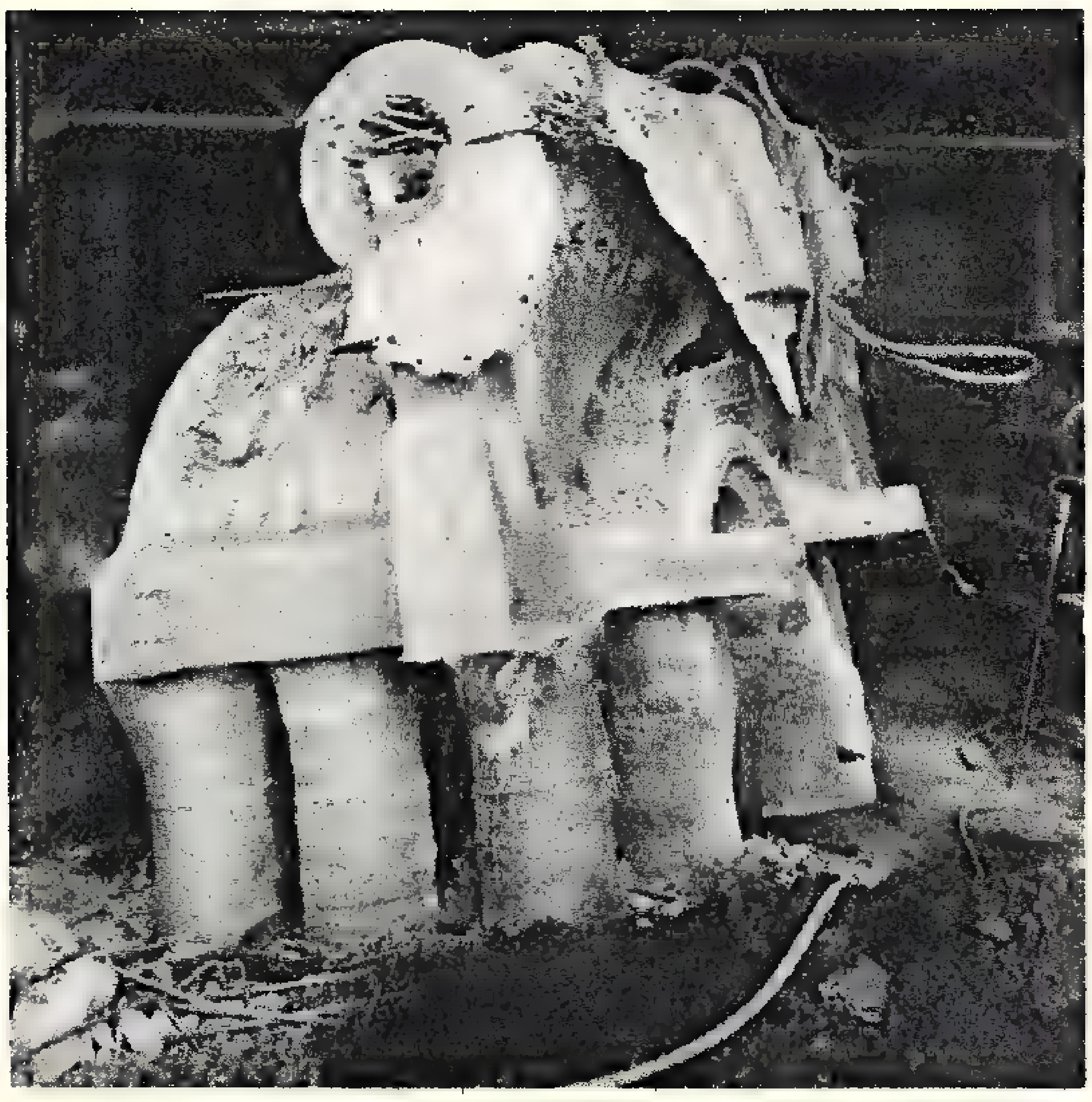
THEIR Chinese junk wrecked at Kalaupapa, Molokai, two French scientists, Capt. de Bischop and M. Joseph Tatibouet, immediately began construction of a new craft in which to continue their study of the South Seas.

Aided by two Chinese carpenters, the pair began work on a catamaran, or "double outrigger," and expect to have it ready for launching in a few weeks. It will have two hulls, each 30 feet long with four feet of draft. It will be a two-masted, junk rigged sailing vessel. They plan to sail it back to France via the Panama Canal.



In this catamaran two French scientists plan to sail from Hawaii to France. It will be junk rigged as shown below.

Casting Turns Out To Be Monster



Like a sculptor's nightmare appeared this giant casting when engineers knocked off the mold. The steel elephant is really the outer high-pressure shell casting of a steam turbine.

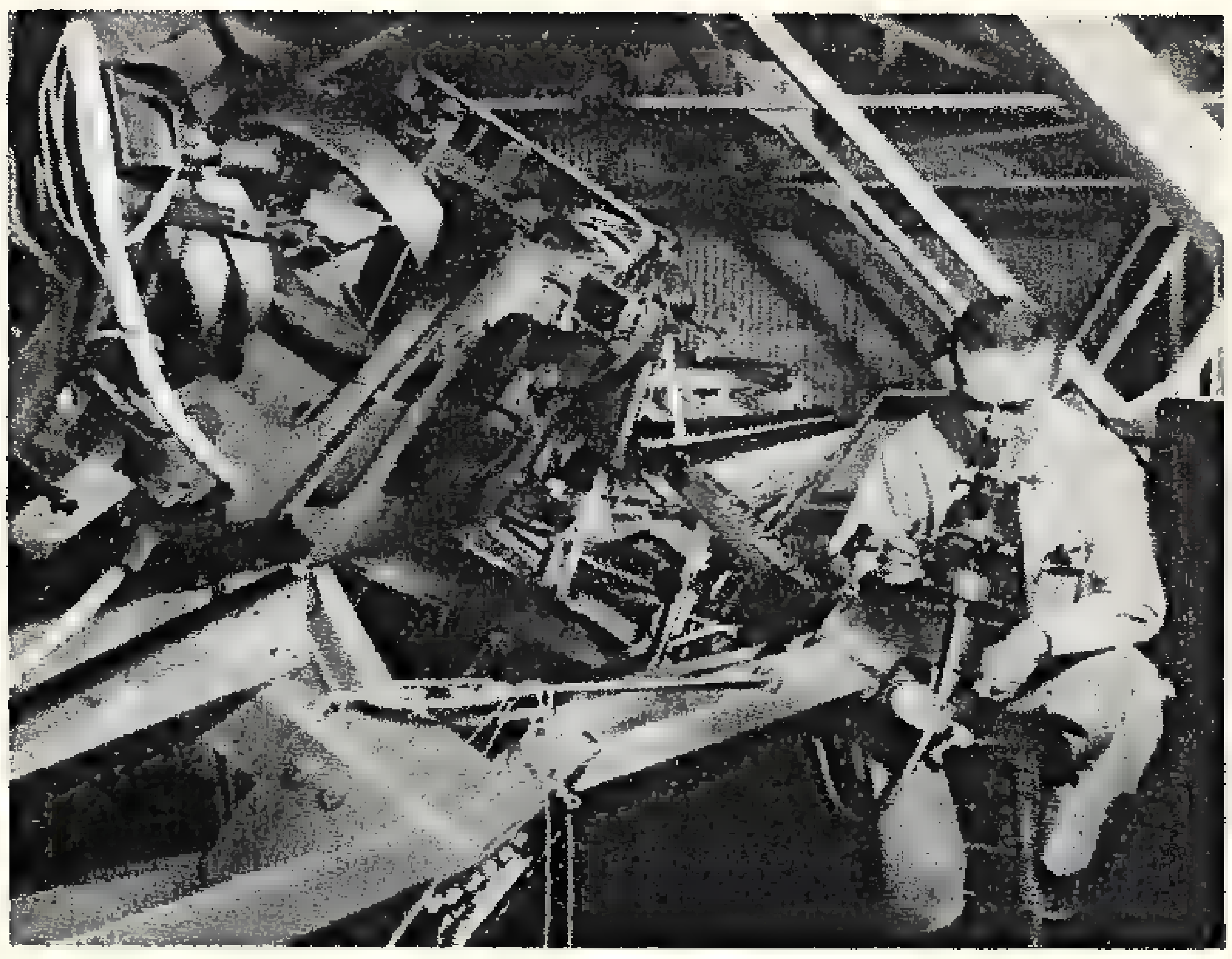
KNOCKING the mold from a giant casting to be used as part of a 40,000-kilowatt turbogenerator, General Electric engineers were startled to discover they had apparently unearthed a prehistoric monster. The excess metal had overflowed the mold, adding a vicious trunk and huge ears to the many-legged monster. After trimming and machining operations are completed, the casting will become the outer high-pressure shell of the steam turbine.

Astronomer Builds Fifty-Foot Transit To Survey Universe

A SURVEYOR'S instrument, not for measuring rods and miles on earth but for accurately surveying millions of miles in space, has been designed by Dr. F. G. Pease for use at the Mount Wilson Observatory.

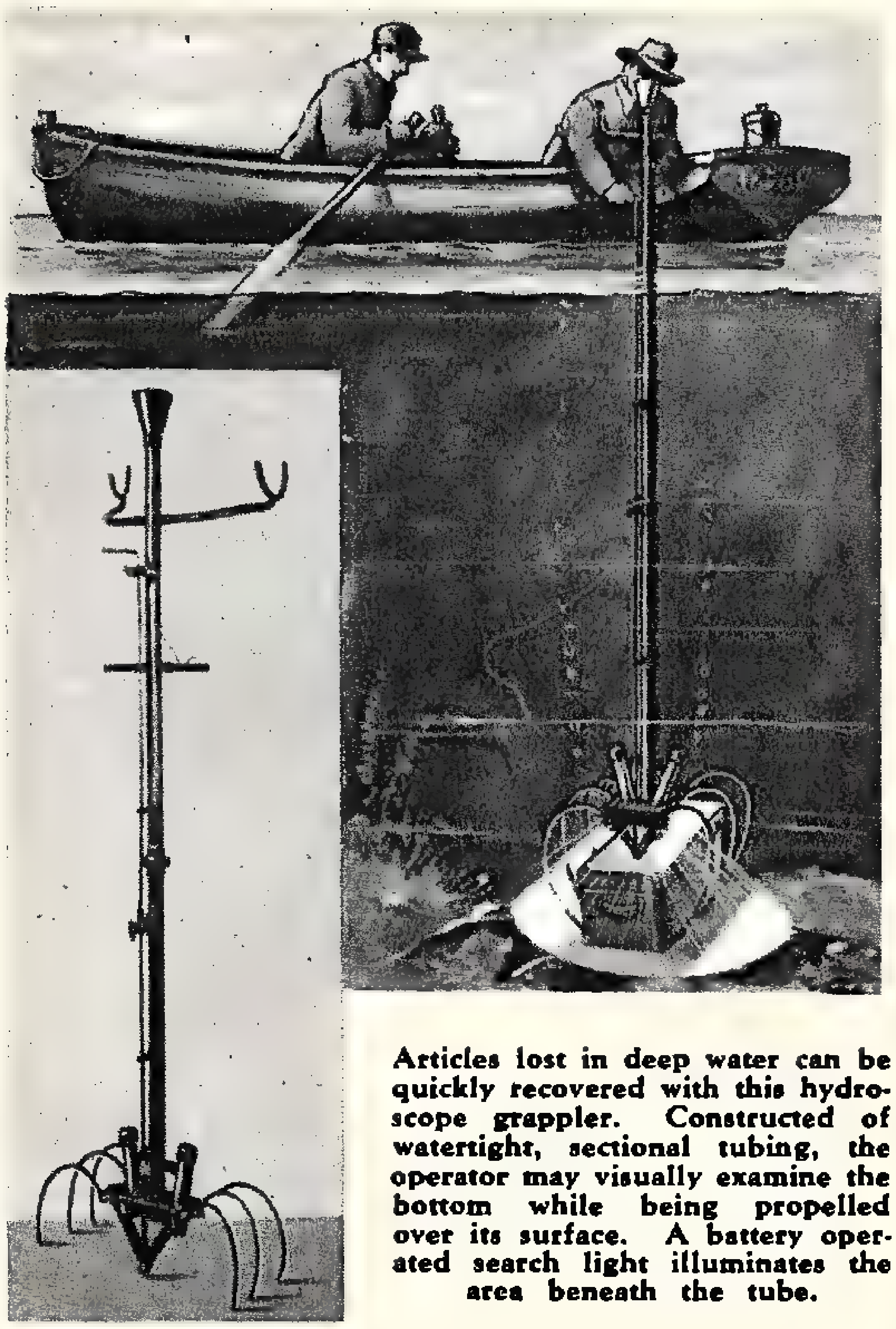
With the assistance of his new instrument, called the interferometer, Dr. Pease determined that the star Epsilon Pegasus, 2,160,000,000,000,000 miles away, had a diameter 100 times as great as that of the sun.

By adjusting two sliding mirrors on a 50-foot steel frame, the star's reflection can be measured. Mathematics then supplies the actual diameter of the star.



This is the interferometer, a 50-foot transit used by astronomers in surveying the universe. Two sliding mirrors are focused on a star and the reading, based upon a mathematical formula, accurately determines the diameter of the star.

New Grappler Has Sighting Tube



Articles lost in deep water can be quickly recovered with this hydroscope grappler. Constructed of watertight, sectional tubing, the operator may visually examine the bottom while being propelled over its surface. A battery operated search light illuminates the area beneath the tube.

SUNKEN motors, fishing tackle and other articles lost overboard may be quickly recovered with a recently patented hydroscope grappler which can easily pick up a small ring or a heavy motor. A sighting tube illuminates the bottom with light from a small battery, and the grappling hooks can be manipulated from the surface as desired. Additional sections provide for deep water. It was patented by Fred Arnold of Cambridge, Ohio.

Atom Gun Will War On Cancer

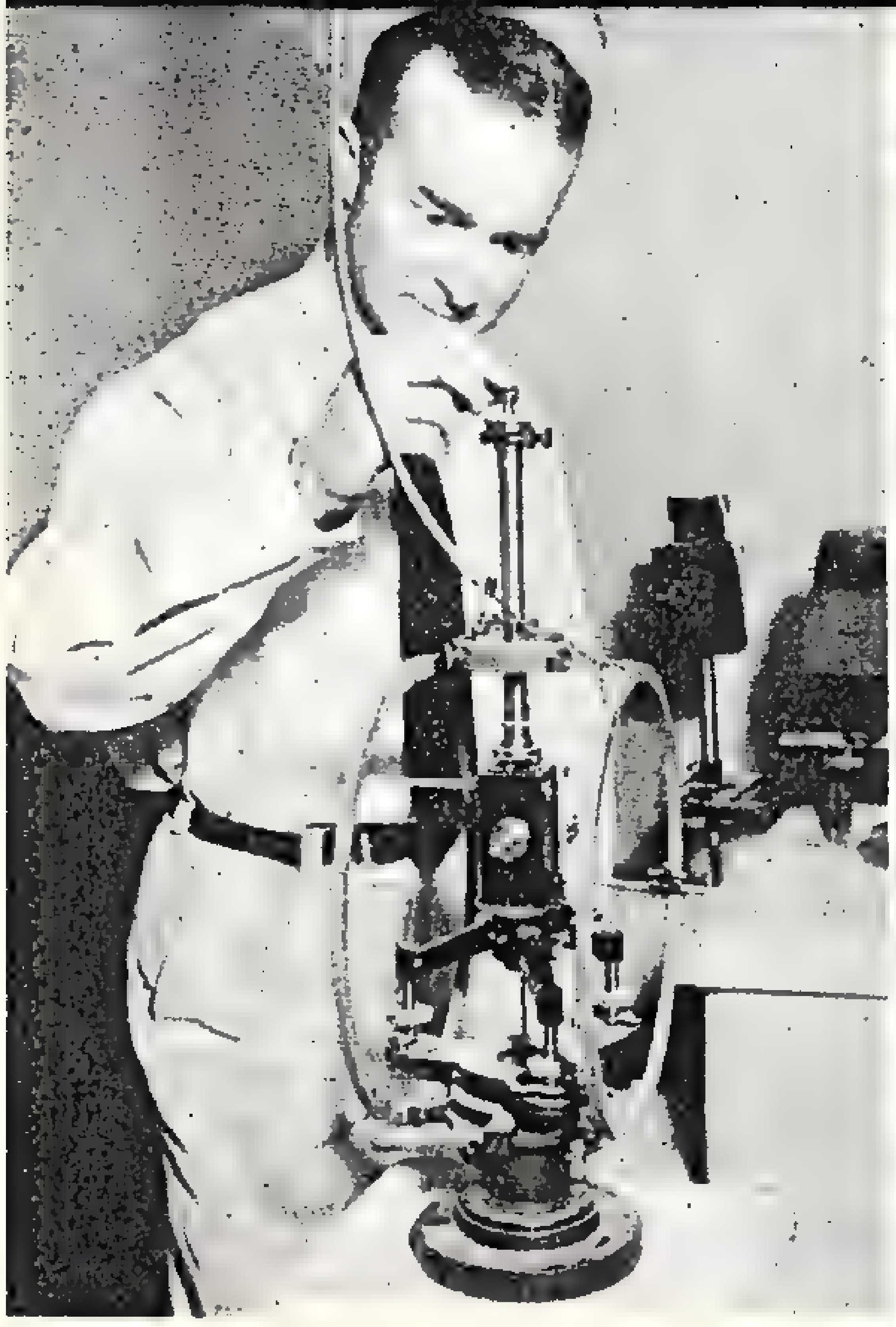
SCIENCE continues to marshal its forces in the war against cancer, the latest addition being a new atom gun with a potential of 2,500,000 volts recently constructed at the University of Wisconsin.

The great machine is expected to hurl protons at a velocity of 15,000 miles a second. Present experiments are being directed at developing super X-rays to produce an effective cure for deep-seated cancer.

The experiments are being conducted under the supervision of Dr. D. B. Paarkinson and Dr. R. G. Herb. Last year the two scientists attracted nation-wide attention with their work on a smaller atom gun.

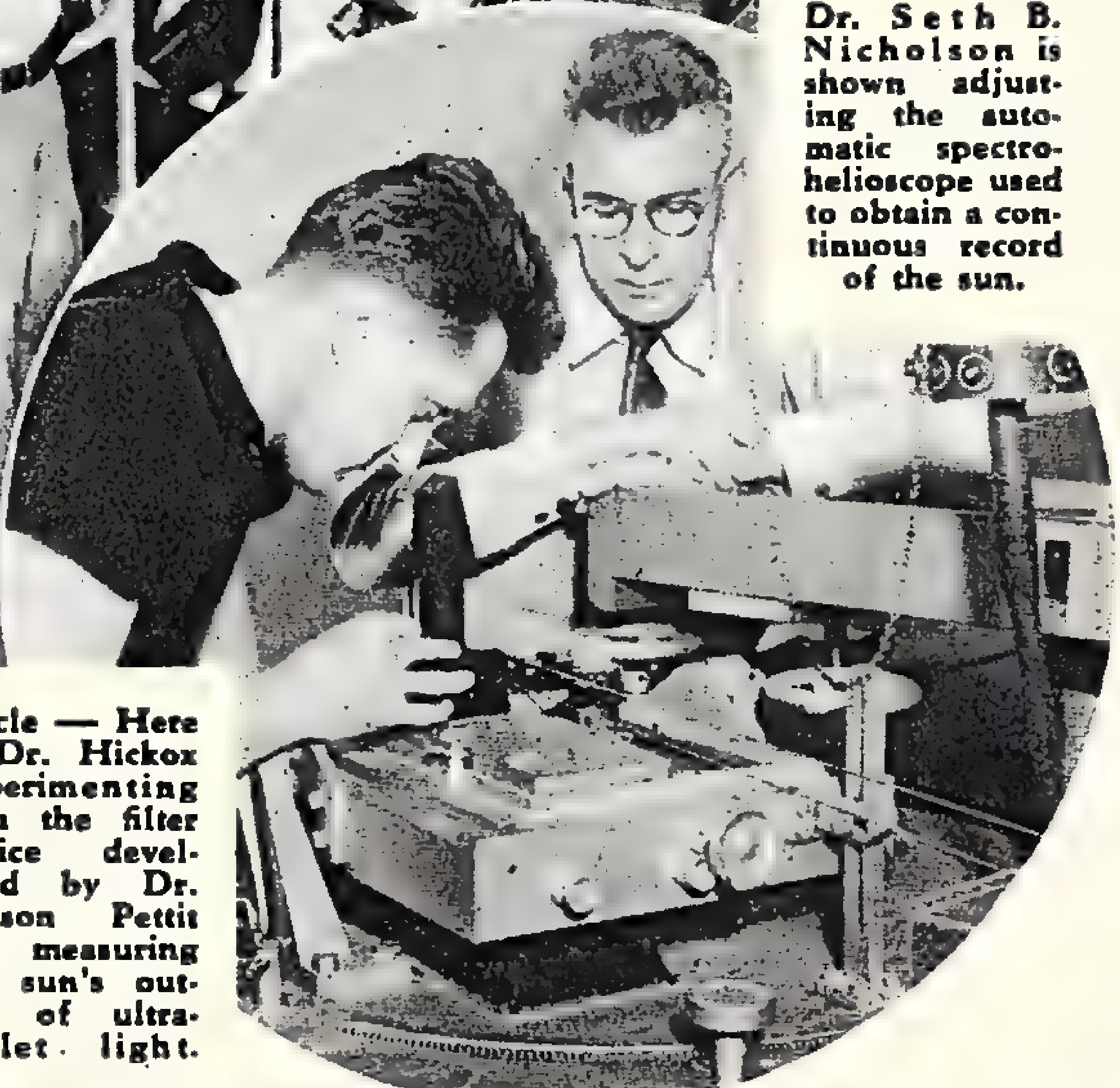
Dr. D. B. Paarkinson, left, and Dr. R. G. Herb of the University of Wisconsin, shown inspecting power plant of a new atom gun expected to develop a potential of 2,500,000 volts.

Astronomers Study Radio Interference



The instrument shown above is the remarkable apparatus with which Dr. Robert S. Richardson, of Mount Wilson Observatory, Pasadena, Calif., discovered that when short wave radios went out of commission about every 54 days, it was because exploding sun gases interferred.

Dr. Seth B. Nicholson is shown adjusting the automatic spectroheliscope used to obtain a continuous record of the sun.



Circle — Here is Dr. Hickox experimenting with the filter device developed by Dr. Edison Pettit for measuring the sun's output of ultra-violet light.

Astronomer Joseph Hickox, of Mt. Wilson, is shown here adjusting the instruments which automatically record all the variations in the magnetic field.

IMPORTANT astronomical problems are being solved with recently invented scientific apparatus by Doctors Nicholson, Hickox and Richardson at Carnegie Institution's Mount Wilson Observatory, near Pasadena, California.

For the first time a new camera makes continuous photographic records of the sun, and an intricate filter device measures its output of ultra-violet light. A new spectrohelioscope enables astronomers to observe masses of exploding gases moving over a 7-inch image of the sun, while a magnotemeter records all variations in the intensity of the earth's magnetic field. Scientists believe that sun spots explosions cause a periodic interruption of short wave radio reception.

Radio Telephone Solves Difficult Railroad Problem

THE difficulty of communication, especially in emergency situations between signal towers and engineers on trains, has long been a major problem of the railroads. When a change of orders came over the wire, nothing could be done but signal the train to stop at the nearest block.

But the French railroads solved a world-wide problem by installing radio sending and receiving apparatus on the locomotives and in the signal towers. The idea was first experimented with on the Rouen-Paris run, and radios were immediately adopted as standard equipment. Today, engineers and signal tower chiefs are in constant communication.

The circled photograph shows the engineer talking into and receiving orders from one instrument, but the radio itself is in a compact box on the front of the locomotive, as shown.

Camera Shoots Inside Of Oil Well

The stake-like affair held by Miss Ann Hollenburg, and demonstrated at the recent Tulsa, Oklahoma, Oil Exposition is the new power-driven, electric-lighted oil well camera.

CAMERAS go everywhere these modern times, into the air above, the waters beneath and, now, into the very earth itself. For today there is a 4-foot, power-driven camera, carrying its own electric light and automatically taking pictures every three minutes, that follows the oil or rock drill down the hole to a 10,000-foot depth to secure photographs of the earth's strata.

Novel Gas Gun Is Death On Flies

SOMETHING of a crack shot is Dr. J. F. McClendon, of the University of Minnesota, who will not permit flies in his classroom or laboratory.

His air gun is loaded with pyrethrum concentrate, which is four times as strong as ordinary insecticides. When a fly zooms in to put on an annoying aerial exhibition, plop! goes the good doctor's trusty gun, and there is one less fly to fight against.

Dr. J. F. McClendon, University of Minnesota, is shown demonstrating his recently invented fly-gun, which shoots a powerful chemical at flies. The poisonous vapor kills them.

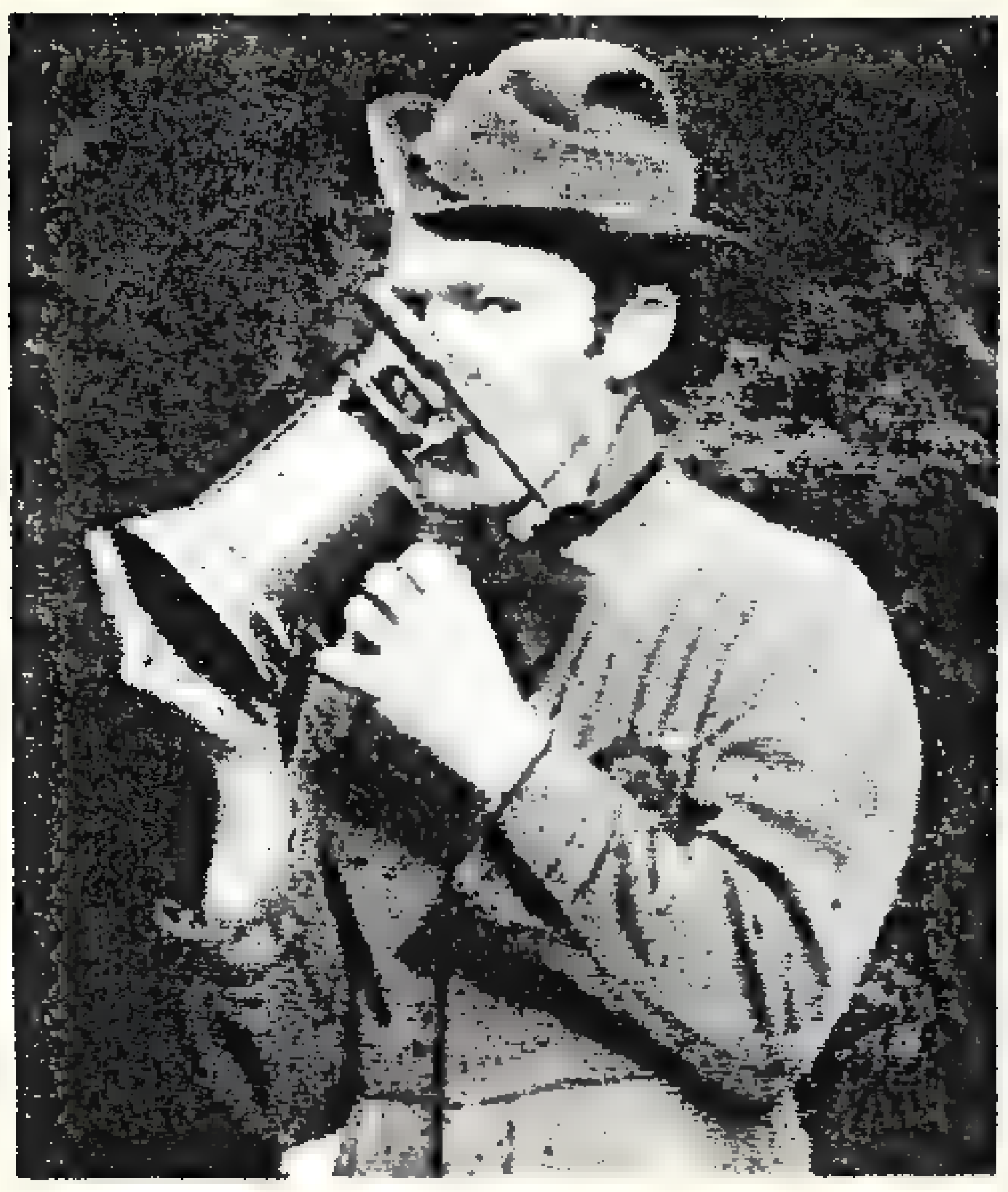
He Finds Music in Plumbing Tools

THOSE tools that plumbers once left behind have been given new uses by "Red" Smith of Los Angeles. He has turned them into musical instruments.

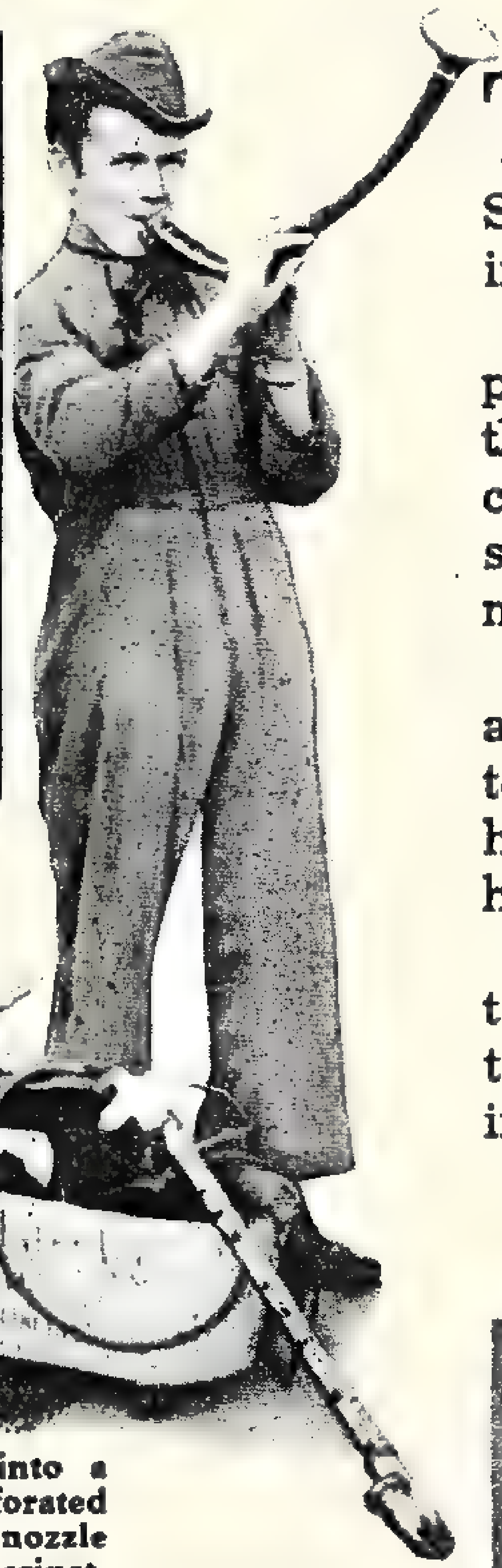
Red was a professional crooner and saxaphone player. When work became slack in the movie studios and theaters he took up the creation and playing of unique musical instruments. And get work he did—as the musical plumber.

He plays all the plumbing tools. Yes, sir, actually plays them, for he fashioned all the tools into musical instruments. And, to keep his act in character, he wears coveralls and hauls his tools around in a bathtub.

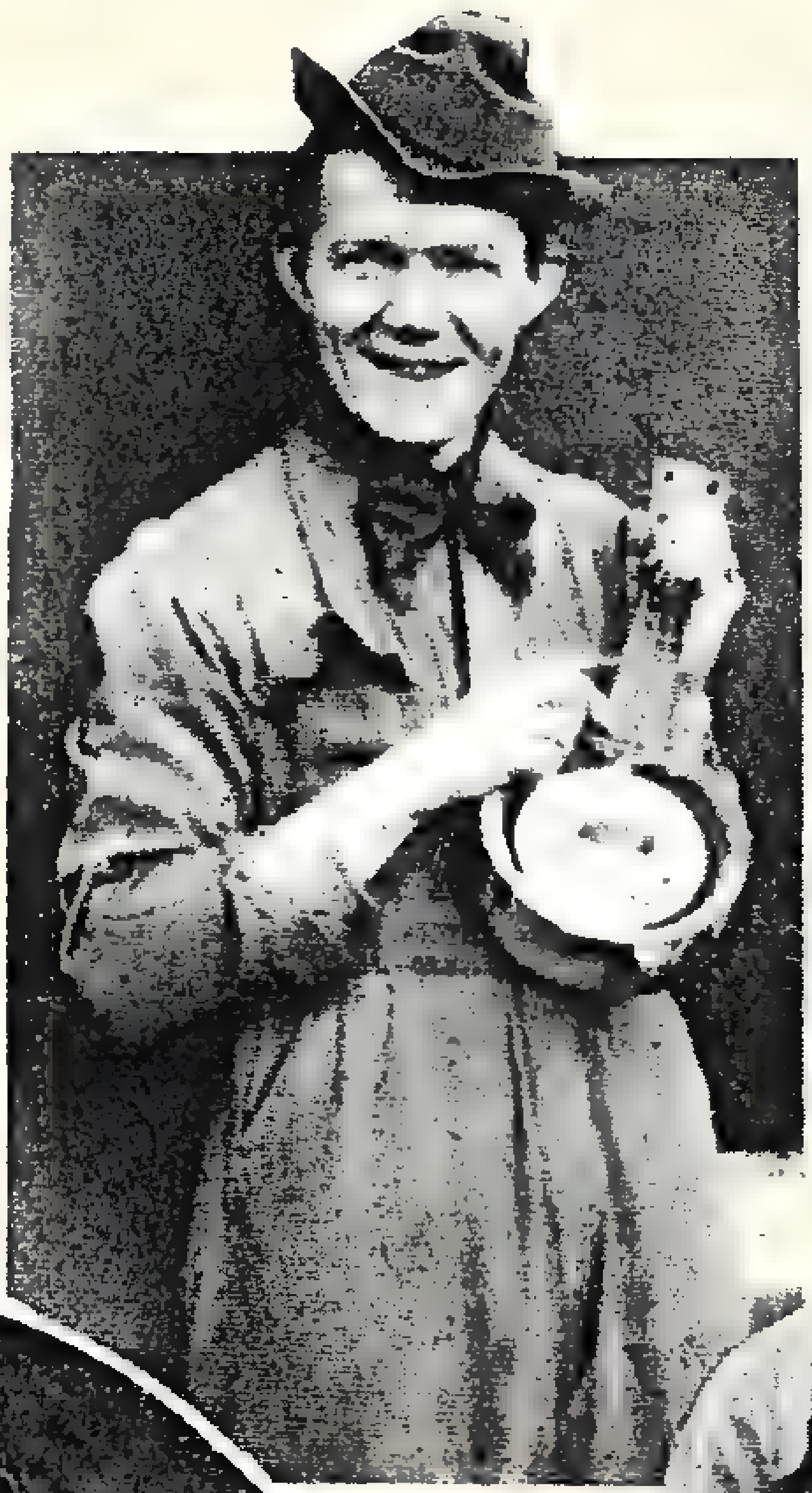
To hear the strains of his musical blowtorch, suction pump or water faucet, is first to laugh, then marvel over his mechanical ingenuity and unique musical cleverness.



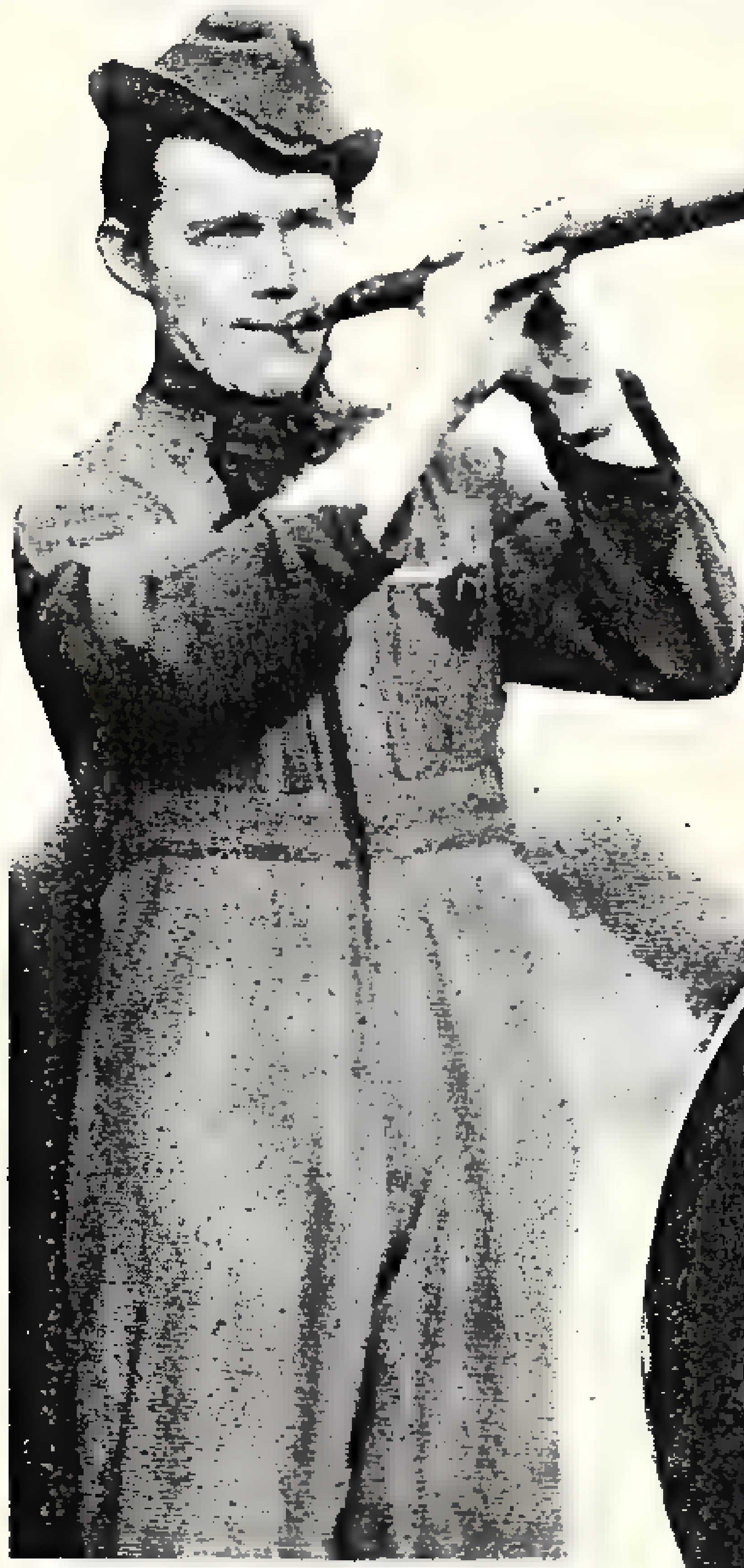
Above—By inserting a trumpet and mouthpiece into the hole where the pump ordinarily screws in, Red produced what he calls the hot blow torch trumpet.



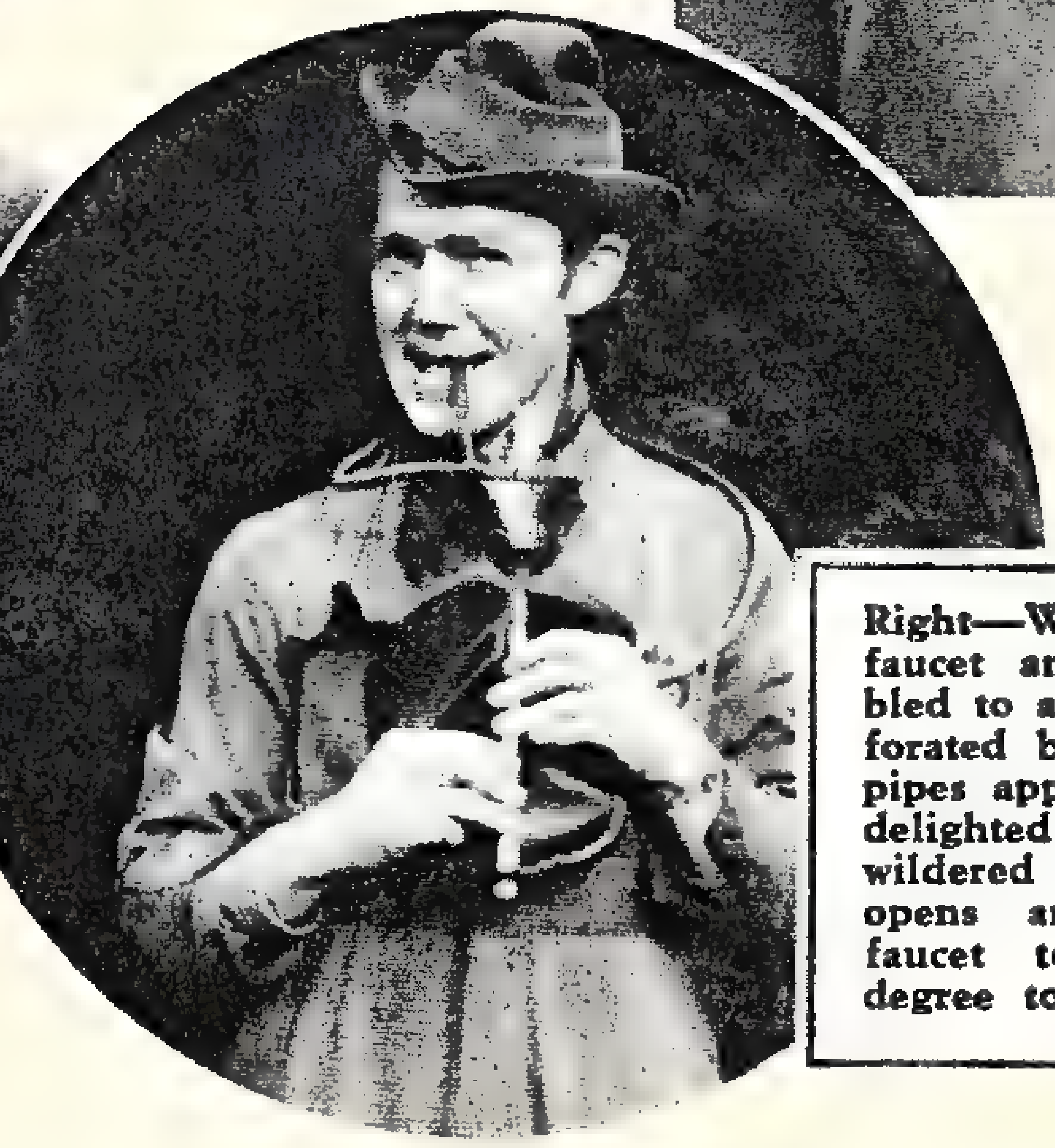
Red inserted a cornet mouthpiece into a length of shower hose (above), perforated for finger play, plugged in the nozzle and found himself with a rubber clarinet.



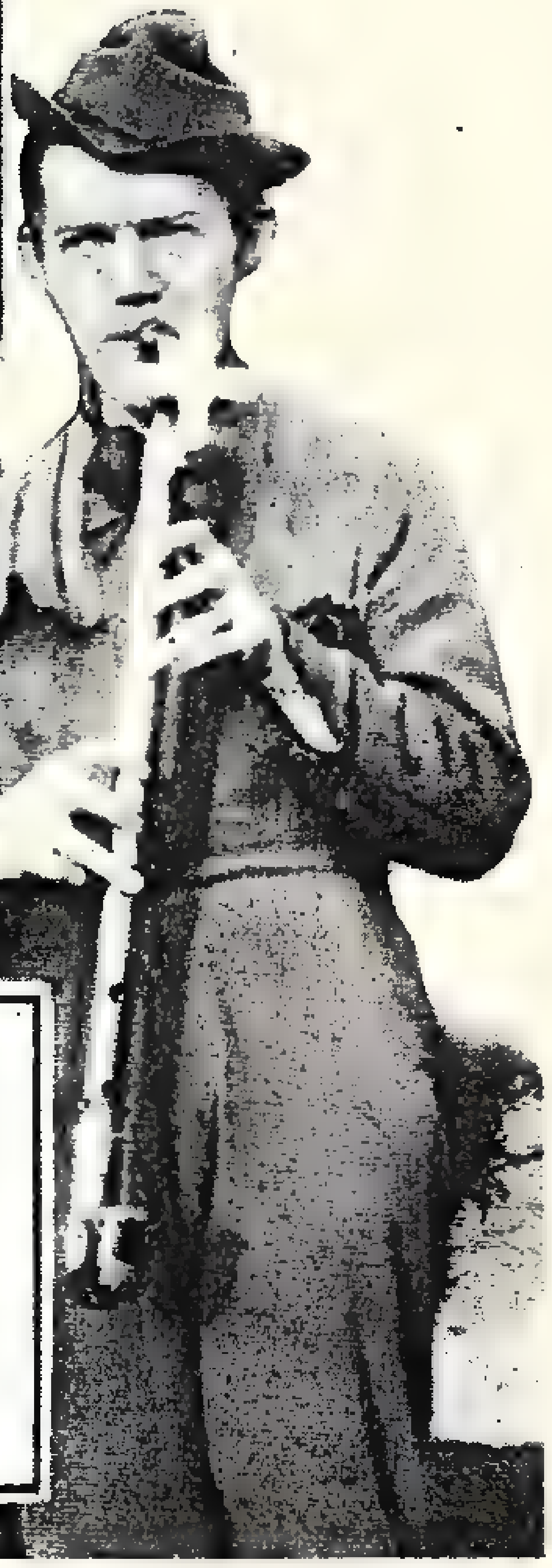
By turning a pound coffee can upside down inside an enameled stew pan, Red strung up an instrument to rival the real banjo. He is seen strumming the pan-can in the photograph at left.



The plunger or "plumber's friend" proved itself a real friend to Red, who tricked it up with a contra-bassoon reed in Key of C, then blew hot swing music out of it. And that took real ingenuity.



Red added a fife and so solved the problem of what to do with old hot water bottles. He calls this unusual oddity the plumber's bagpipes.

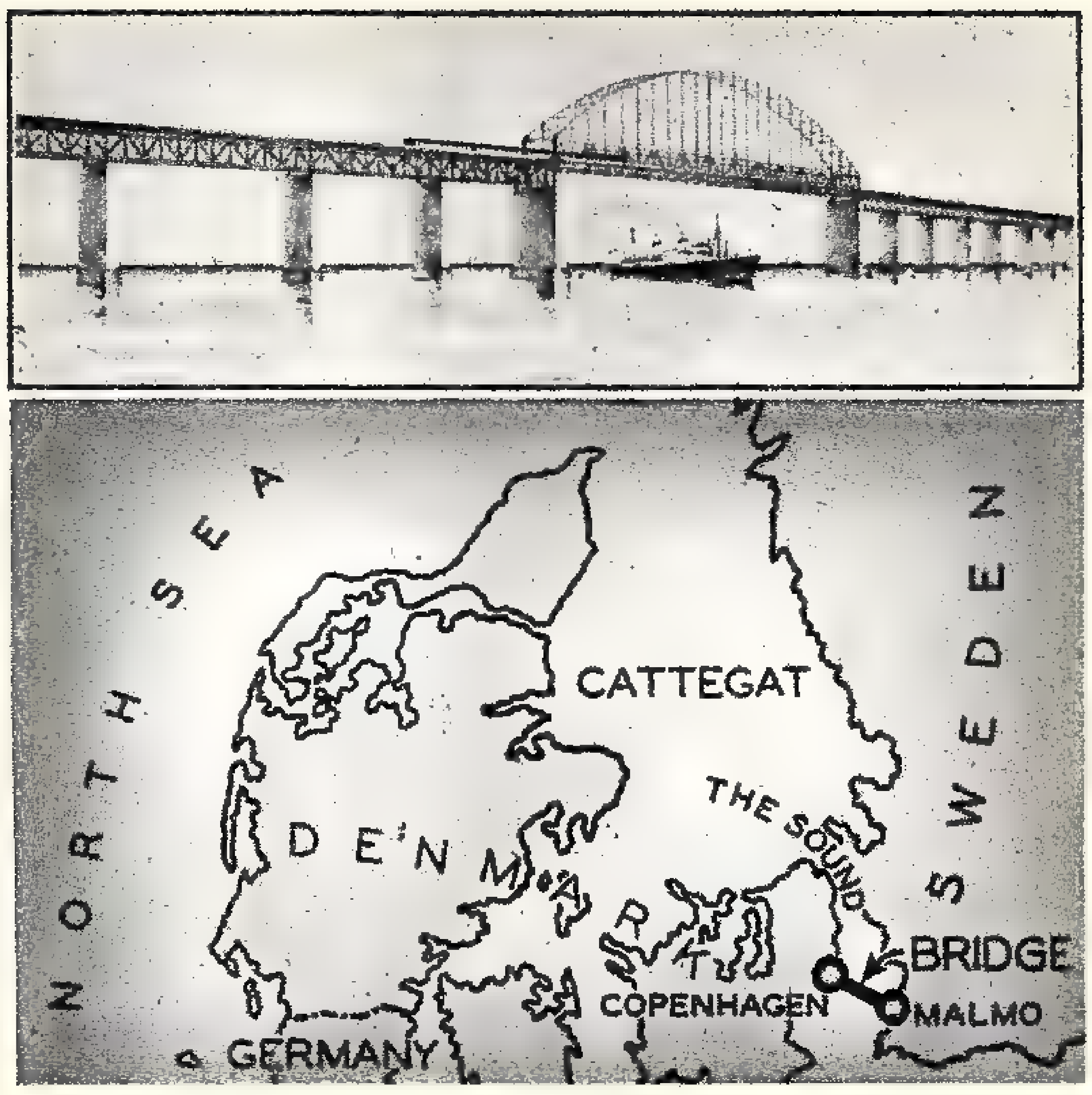


Right—With a water faucet and trap assembled to a length of perforated brass pipe, Red pipes applause from his delighted but rather bewildered audience. He opens and closes the faucet to the wanted degree to change tones.

New Denmark-Sweden Bridge Spans Famous Battle Inlet

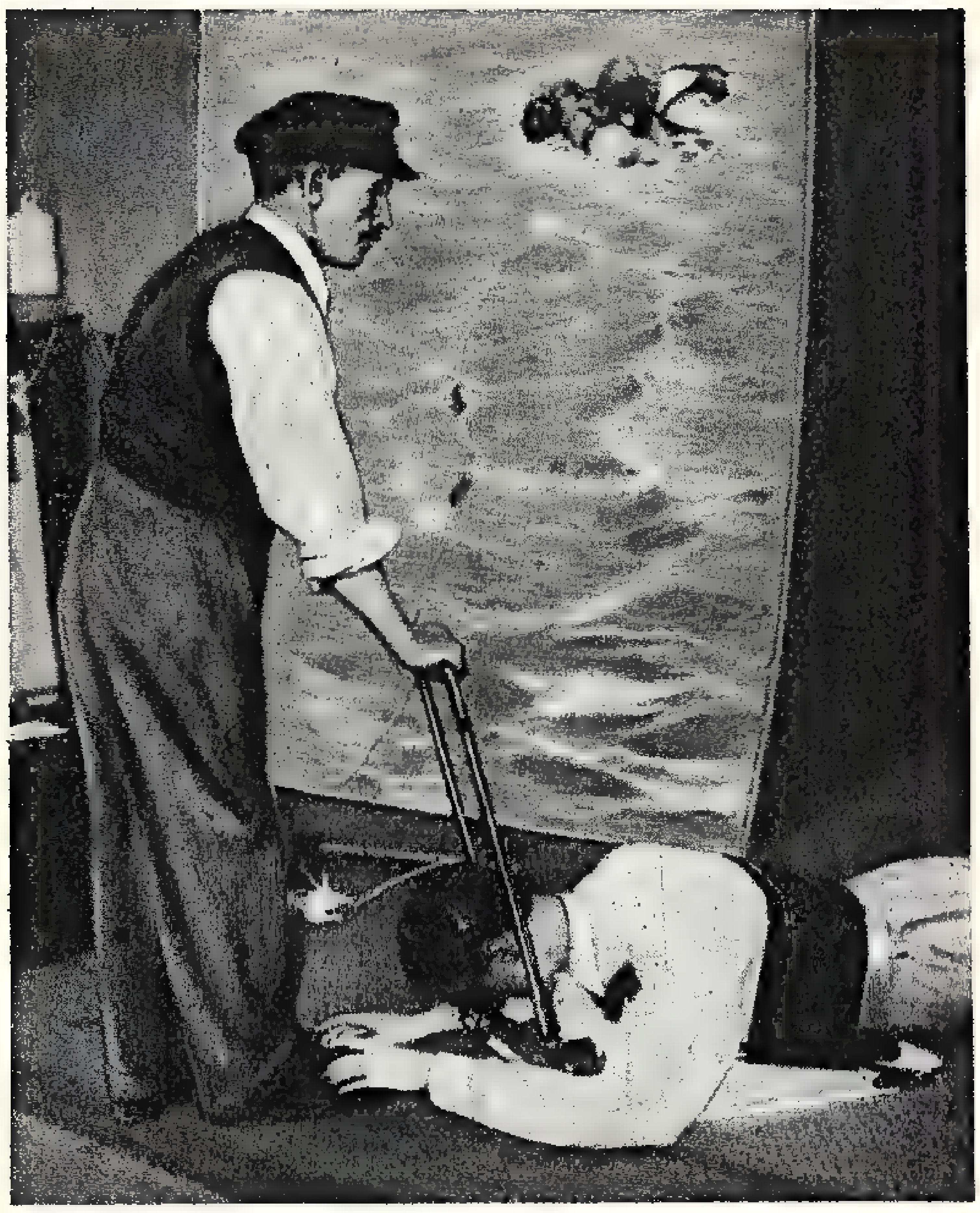
TO JOIN Denmark and Sweden, a great bridge is now being rushed to completion betwen Malbo and Kjobnhavn. It spans the inlet between the Baltic and the North Sea, at the spot, where, during the World War, submarines fought against enemy battleships.

The Oresund Bridge will span eleven miles of open sea, with the central arch 150 feet above the sea, sufficiently high for the largest ocean liner to pass beneath without lowering her masts or funnels. The two navigation channels are bridged by single 1,000-foot bowstring spans. There will be levels for trains, automobiles and push cycles, of which there are millions in use on the Continent.



This new railroad and motor bridge spans the inlet between the Baltic and the North Sea where, during the World War, German and British submarines fought against enemy ships.

Life-Saving, A One-Man Operation



Life-saving now becomes a one-man operation instead of using men as formerly, for with this new apparatus, the chest bellows, operated by handle, provides artificial respiration.

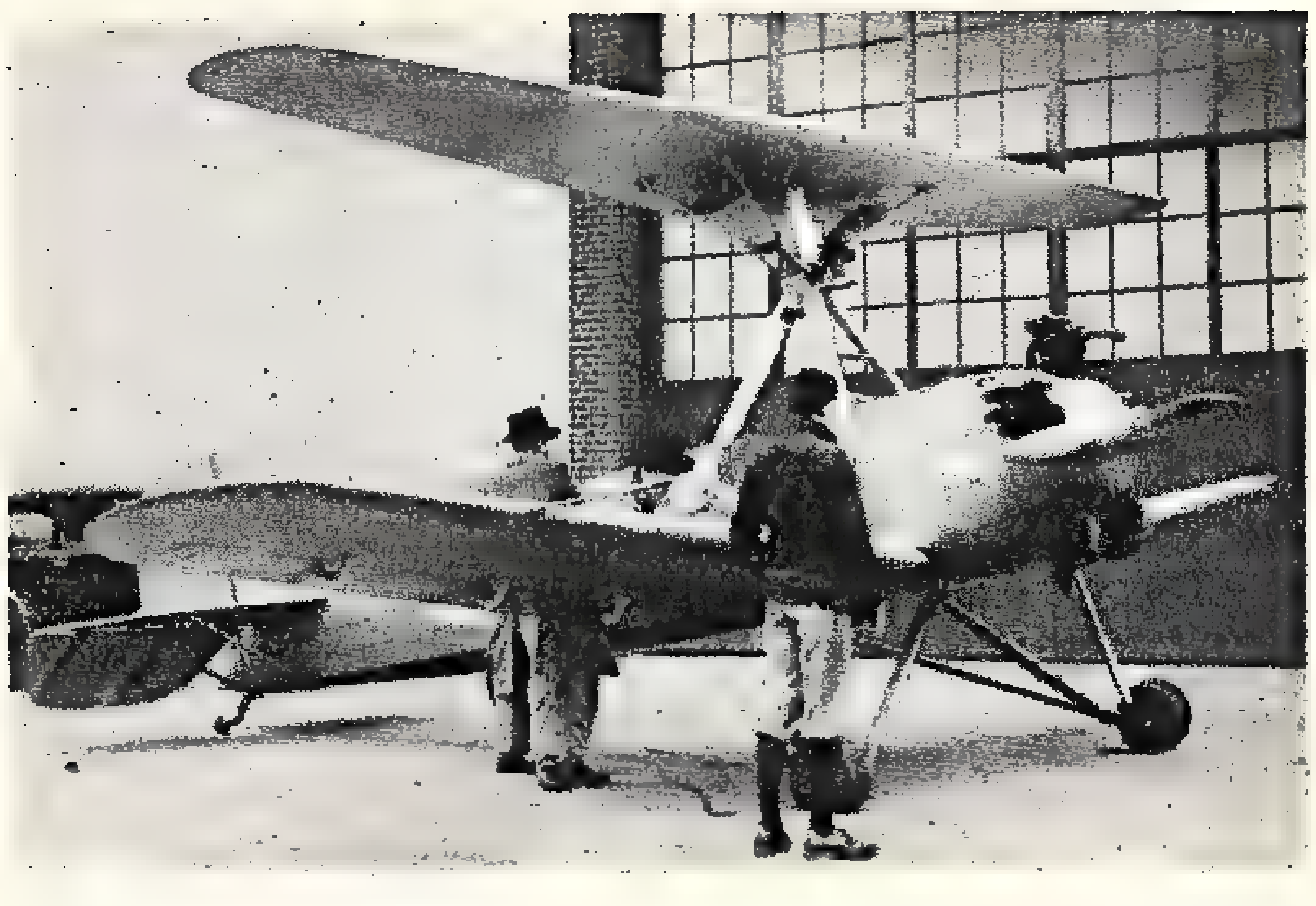
AMONG the many exhibits on display recently at the Salon Nautique, Paris, was the latest in life-saving apparatus.

Where formerly it required the aid of two men to complete the job of artificial respiration, the new apparatus needs only one man to resuscitate the water victim. The operator straps the bellows beneath the unconscious man's chest, lays him face downward, adjusts the head-rest to align the windpipe, then rocks the handle of the respirator.

Vertiplane's Wing Locks In Place

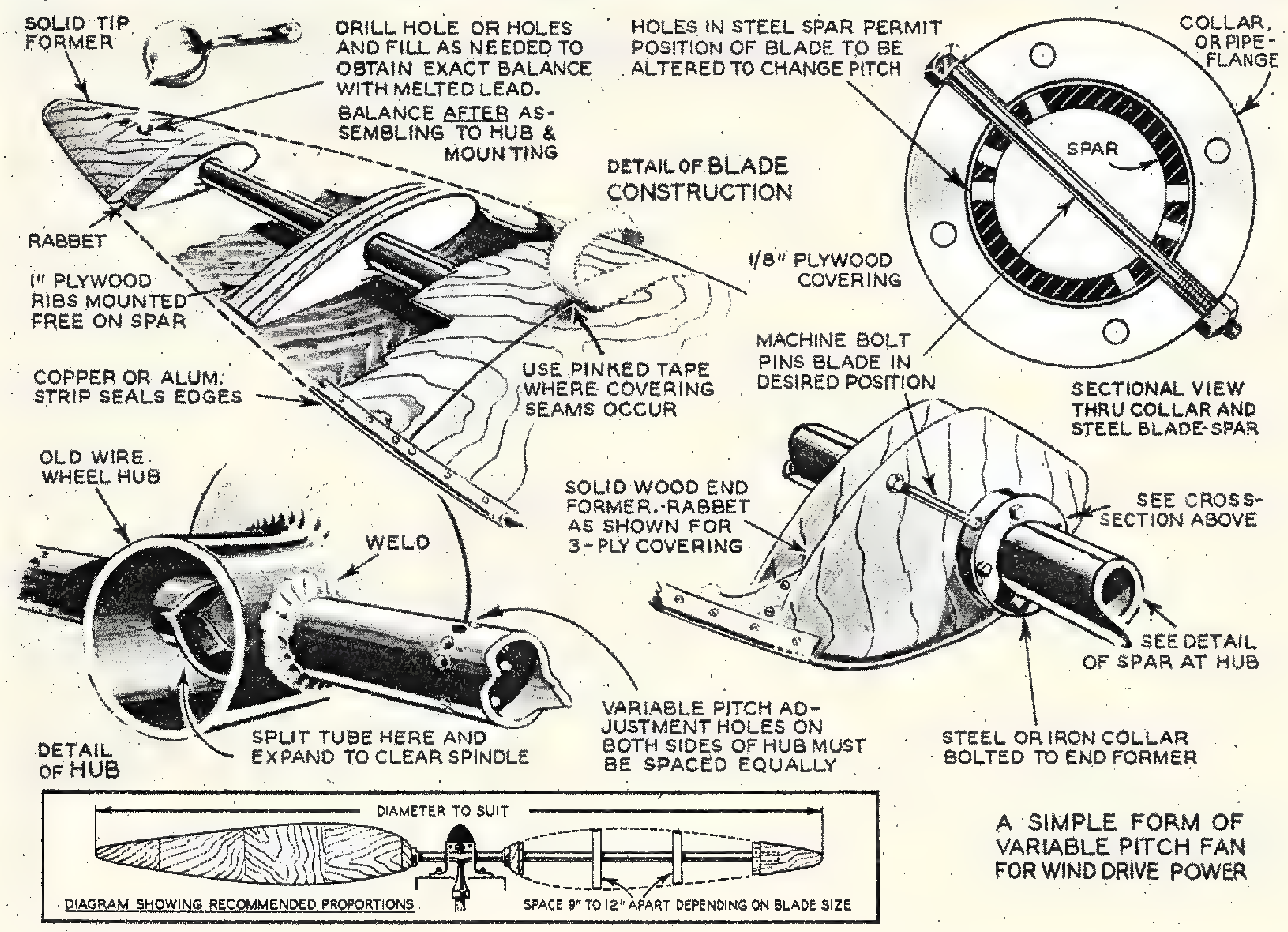
THE vertiplane, closely related to the autogiro, and perhaps later to evolve into the long sought helicopter, is the invention of Gerard P. Herrick, cousin of the late Ambassador Herrick. It was tested recently at Fairchild Field, N. Y.

The novel upper wing of the vertiplane functions in the usual byplane manner, or spins like the vanes of an autogiro. So far take-offs have been accomplished with the fixed wing, but when altitude was reached, the wing was made to spin and hover the ship over given points. The idea behind all these experiments is to perfect the vertiplane so that it will rise and descend vertically.



Called the vertiplane by its inventor, Gerard P. Herrick, this new type of aircraft is a combination of biplane and autogiro. The novel top wing spins or remains stationary.

Auto Parts Make Efficient


SOLID TIP FORMER
DRILL HOLE OR HOLES AND FILL AS NEEDED TO OBTAIN EXACT BALANCE WITH MELTED LEAD. BALANCE AFTER ASSEMBLING TO HUB & MOUNTING
HOLES IN STEEL SPAR PERMIT POSITION OF BLADE TO BE ALTERED TO CHANGE PITCH
COLLAR, OR PIPE-FLANGE
SPAR
DETAIL OF BLADE CONSTRUCTION
RABBET
1" PLYWOOD RIBS MOUNTED FREE ON SPAR
1/8" PLYWOOD COVERING
MACHINE BOLT PINS BLADE IN DESIRED POSITION
COPPER OR ALUM. STRIP SEALS EDGES
USE PINKED TAPE WHERE COVERING SEAMS OCCUR
SECTIONAL VIEW THRU COLLAR AND STEEL BLADE-SPAR
OLD WIRE WHEEL HUB
WELD
SOLID WOOD END FORMER.-RABBET AS SHOWN FOR 3-PLY COVERING
SEE CROSS-SECTION ABOVE
SEE DETAIL OF SPAR AT HUB
DETAIL OF HUB
SPLIT TUBE HERE AND EXPAND TO CLEAR SPINDLE
VARIABLE PITCH ADJUSTMENT HOLES ON BOTH SIDES OF HUB MUST BE SPACED EQUALLY
STEEL OR IRON COLLAR BOLTED TO END FORMER
DIAMETER TO SUIT
DIAGRAM SHOWING RECOMMENDED PROPORTIONS
SPACE 9" TO 12" APART DEPENDING ON BLADE SIZE
A SIMPLE FORM OF VARIABLE PITCH FAN FOR WIND DRIVE POWER

The propeller blades are constructed from plywood with airplane tubing forming the rigid center core. Spacers placed 9 to 12 inches apart serve as mountings for the plywood covering. If one side of the propeller is too heavy drill holes in the tip of the other blade and fill with melted lead. A copper or aluminum strip seals the edges of the blade and prevents chipping.

by DOUGLAS P. ROLFE

ONE of the many problems confronting the prospective builder of a wind driven generating plant is the selection of a suitable windmill or propeller. While the flat-bladed, fan type is usually selected by amateur builders there is a strong argument for the airplane type propeller and as a matter of fact it is becoming increasingly popular. In the first place old airplane propellers are fairly easily obtained and are not at all expensive. While in certain instances an old airplane propeller may prove satisfactory there are many more cases where its value is something less than zero.

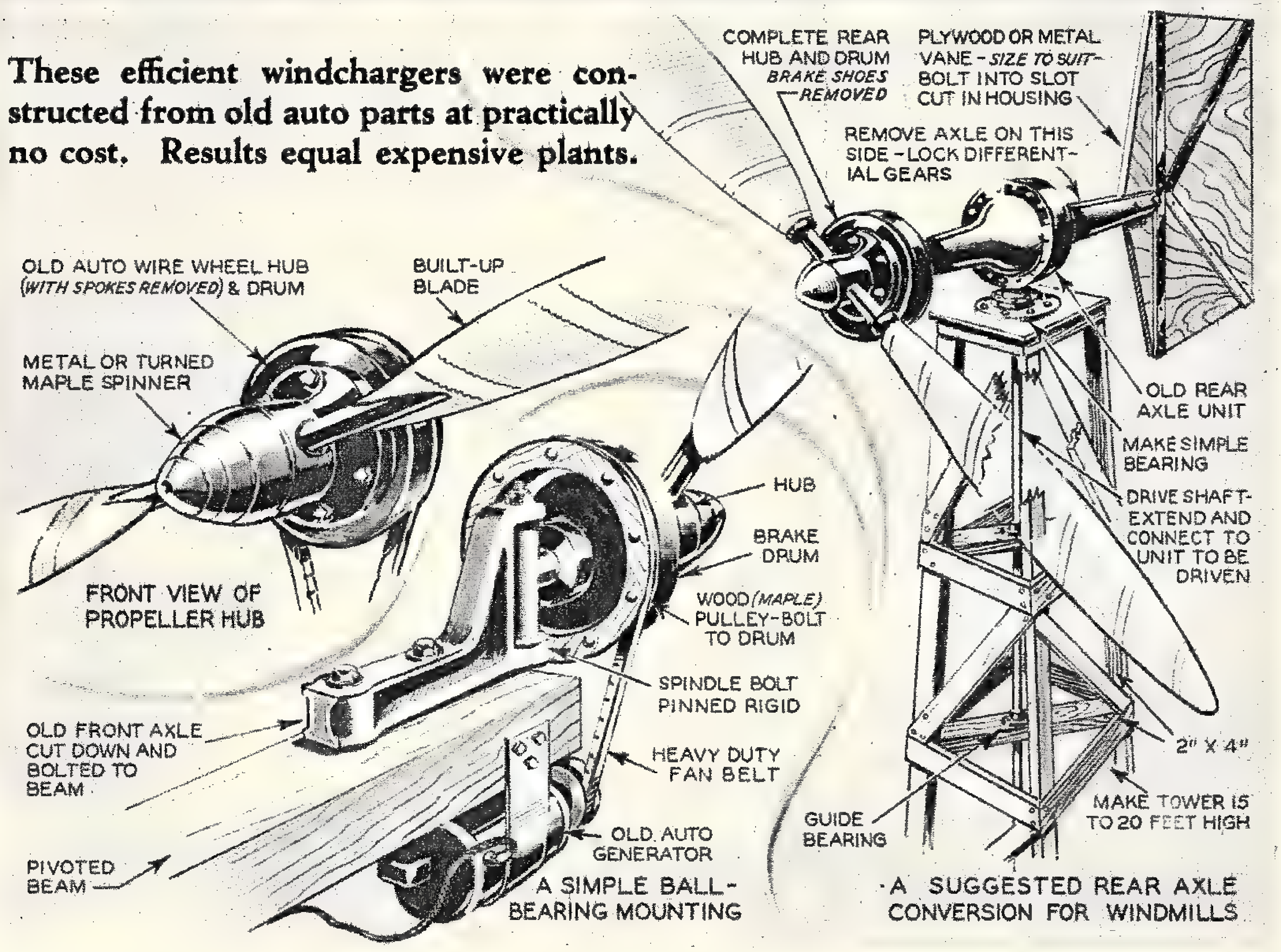
Many times these propellers are too heavy and have a fixed "pitch" which may be quite unsuited to the prevailing winds of your locality.

This article will proceed to outline the construction of a simple, reasonably light and quite practical "fan" which is built something in the manner they put autogiro vanes together. It can be built by anyone able to use tools and has moreover the answer to your particular "pitch" troubles incorporated in its design!

The first item is a ball bearing hub. This would be expensive and difficult to produce in a home workshop. Fortunately this necessity does not exist as the junk yards are teeming with hubs, and spindles, too, ideally suited for the purpose. Any light car hub and spindle is adaptable although for small units the rear hub from an old motorcycle may be used. As the drawings show, this hub forms the starting point for the wind propeller. The blades, built up of plywood on formers, are spaced along the central spar and are adjustable to provide variation of "pitch." How this is done can be seen quite

WINDCHARGER Plants

These efficient windchargers were constructed from old auto parts at practically no cost. Results equal expensive plants.


COMPLETE REAR HUB AND DRUM *BRAKE SHOES REMOVED*
PLYWOOD OR METAL VANE - *SIZE TO SUIT* - BOLT INTO SLOT CUT IN HOUSING
REMOVE AXLE ON THIS SIDE - LOCK DIFFERENTIAL GEARS
OLD AUTO WIRE WHEEL HUB (*WITH SPOKES REMOVED*) & DRUM
BUILT-UP BLADE
METAL OR TURNED MAPLE SPINNER
OLD REAR AXLE UNIT
MAKE SIMPLE BEARING
DRIVE SHAFT - EXTEND AND CONNECT TO UNIT TO BE DRIVEN
HUB
BRAKE DRUM
WOOD (*MAPLE*) PULLEY - BOLT TO DRUM
FRONT VIEW OF PROPELLER HUB
SPINDLE BOLT PINNED RIGID
OLD FRONT AXLE CUT DOWN AND BOLTED TO BEAM
HEAVY DUTY FAN BELT
2" X 4"
MAKE TOWER 15 TO 20 FEET HIGH
GUIDE BEARING
OLD AUTO GENERATOR
PIVOTED BEAM
A SIMPLE BALL-BEARING MOUNTING
A SUGGESTED REAR AXLE CONVERSION FOR WINDMILLS

Junked automobile parts are ideal for use in building a sturdy windcharger plant. A front axle cut down and bolted to the pivoted beam makes an ideal propeller mounting. The ball bearing hub of an auto wheel provided with a maple wood pulley is ideal for windcharger use. Mount the generator under the pivoted beam and gear to propeller with "V" belting.

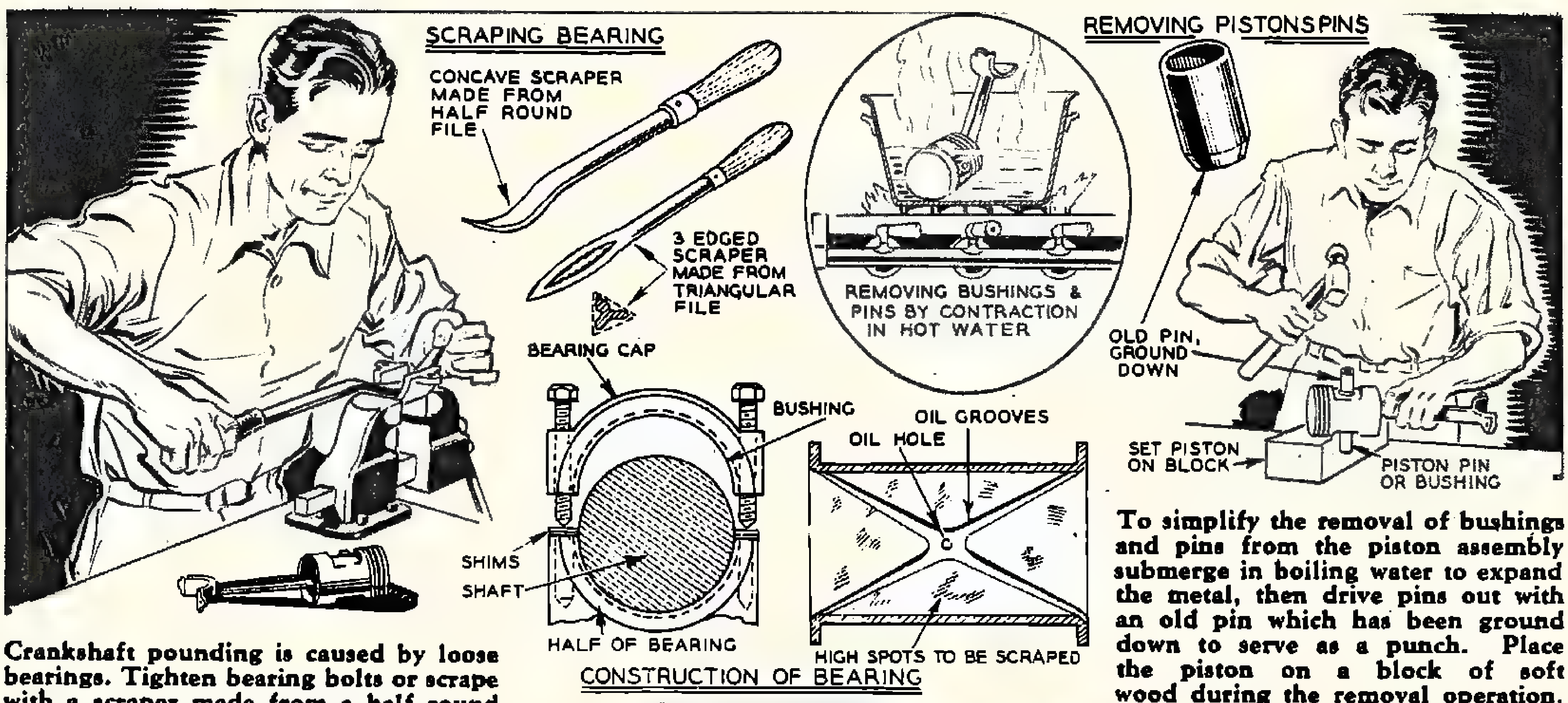
clearly from the detail diagrams. The central spar or tube may be of iron but it is far better to use a length of steel tube for this. Tubing such as is used in airplane construction is ideal for the purpose. The diameter of the tube is in direct relation to the diameter of the propeller you plan to build. General proportions are shown in the accompanying drawings, although actual constructional details may be varied to suit the builder's own ideas and, to some extent, his materials available. For instance, the blades are adjustable on the spar itself as shown, but two tubes may be employed and attached to the hub in such manner as to permit varying the pitch at this point of attachment if so desired.

It is assumed that most amateur builders plan on using automobile generators for their wind electric plants. This presupposes some gearing up to insure adequate revolutions in a moderate breeze. To accomplish this a hard wood pulley is attached to the hub with a length of "V" belting to make the connection direct to the standard generator pulley. The hub pulley for best results should be between 8 and 10 inches in diameter. Heavy duty automobile fan belts are excellent for the drive belt.

For really large ambitious wind plants something more substantial is necessary. Many ingenious ideas have been developed and carried out with standard automobile parts.

For a light windcharger plant an old front axle cut down and bolted to the pivoted beam makes an ideal mounting. In this case the wood pulley is bolted to the back of the brake drum with the fan belt connecting to the generator which is mounted directly underneath on a bracket. A plywood vane of suitable size attached to the opposite end of the beam completes the windcharger. For best results the device should be mounted at least twenty feet in the air either on a housetop or tower.

CHECKING *the* CAR *for Elusive*


SCRAPING BEARING
CONCAVE SCRAPER MADE FROM HALF ROUND FILE
3 EDGED SCRAPER MADE FROM TRIANGULAR FILE
BEARING CAP
BUSHING
SHIMS
SHAFT
HALF OF BEARING
OIL GROOVES
OIL HOLE
HIGH SPOTS TO BE SCRAPED
CONSTRUCTION OF BEARING
REMOVING BUSHINGS & PINS BY CONTRACTION IN HOT WATER
REMOVING PISTONSPINS
OLD PIN, GROUND DOWN
SET PISTON ON BLOCK
PISTON PIN OR BUSHING

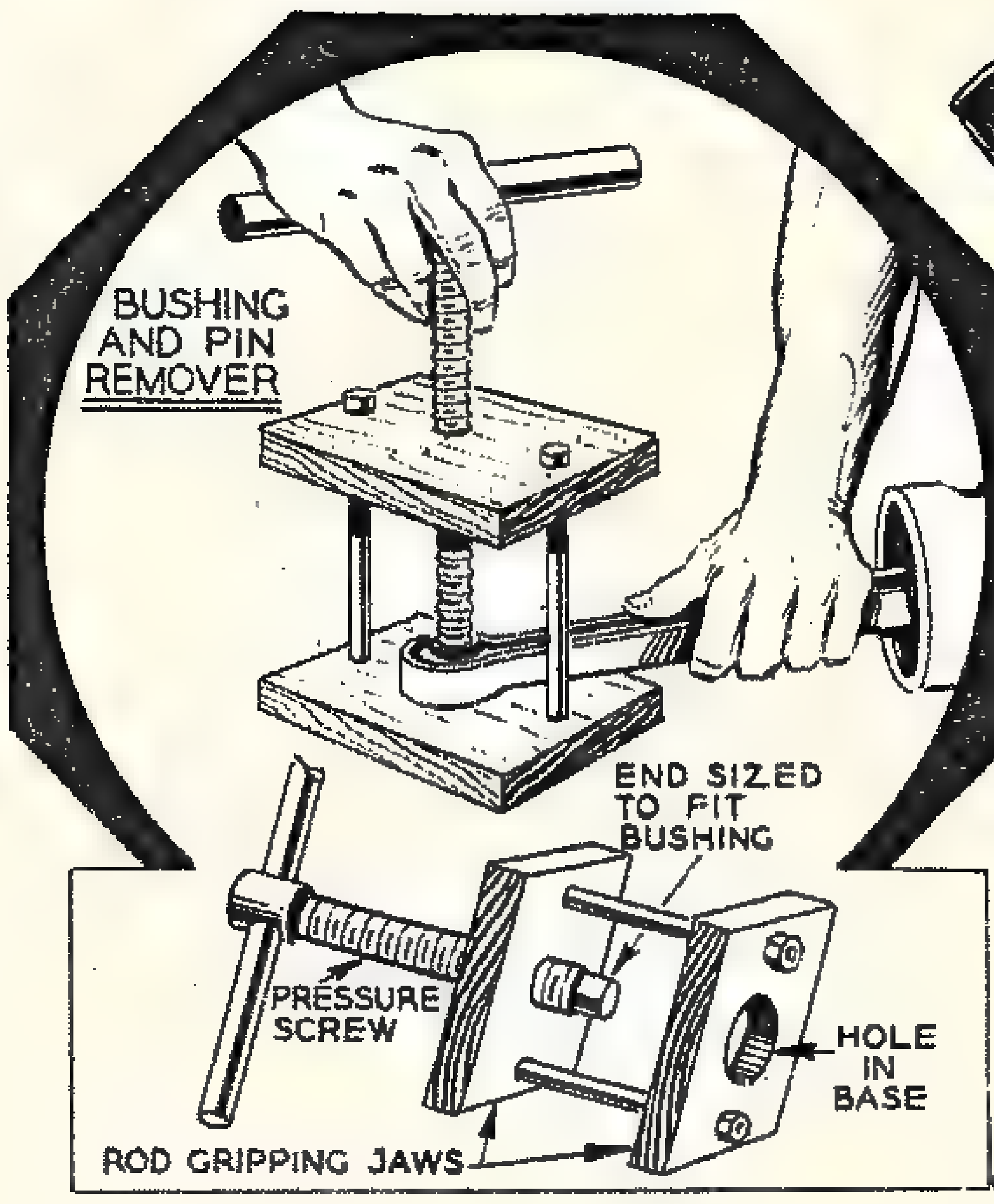
Crankshaft pounding is caused by loose bearings. Tighten bearing bolts or scrape with a scraper made from a half round file as shown above. Use Prussian blue in the scraping process so that surface is made perfectly round and not oval.

To simplify the removal of bushings and pins from the piston assembly submerge in boiling water to expand the metal, then drive pins out with an old pin which has been ground down to serve as a punch. Place the piston on a block of soft wood during the removal operation.

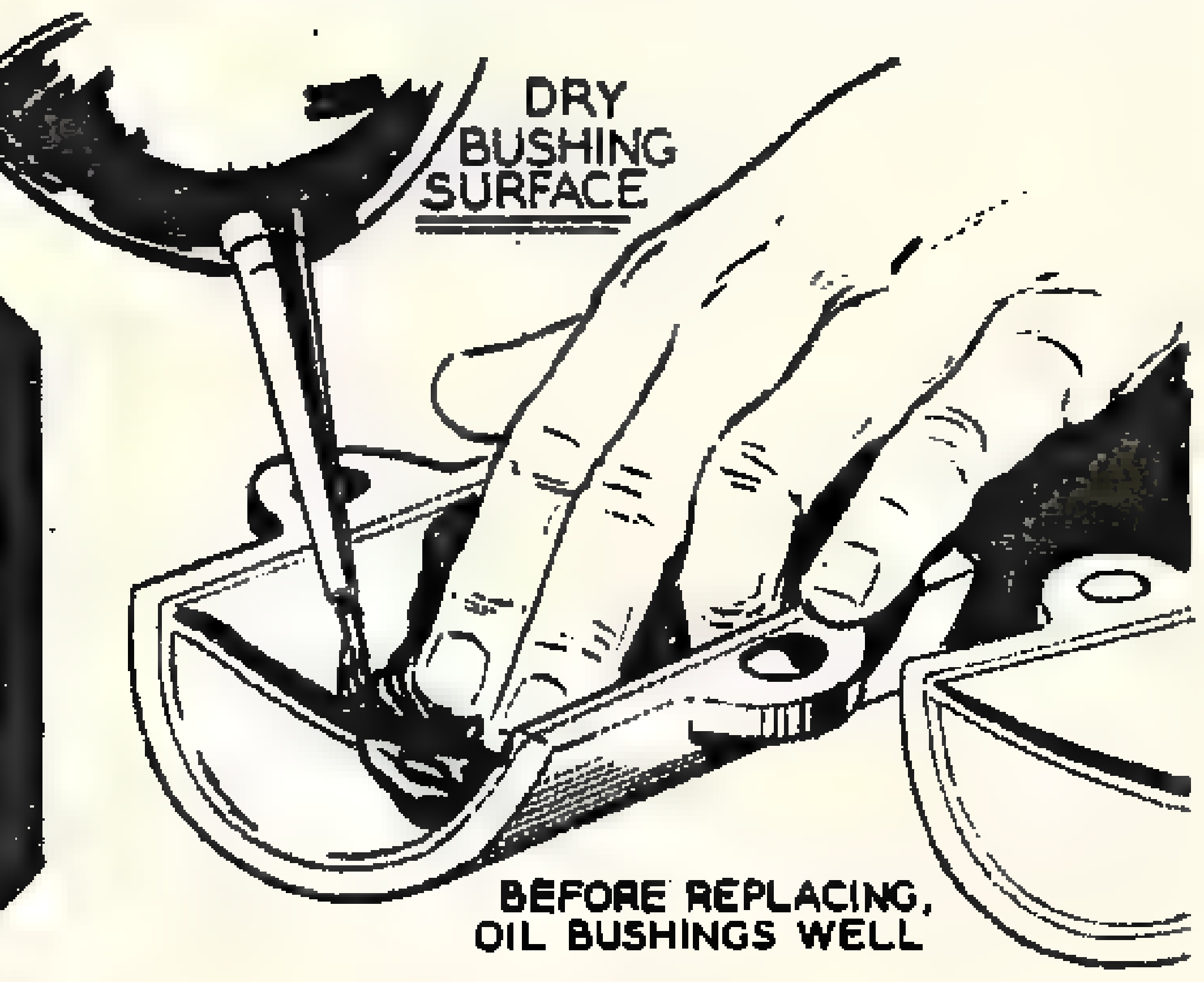
NO MATTER how good an automobile motor may be it will eventually get noisy and begin to lose power. While the power factor is very often ignored the presence of noise is most objectionable.

Crankcase pounding, valve hiss and piston slap are the more common causes for a motor to be noisy and lacking in its power output. While these items appear to involve special processing that can only be attempted by an experienced mechanic, it is possible for anyone with a fair knowledge of automobile construction to correct trouble.

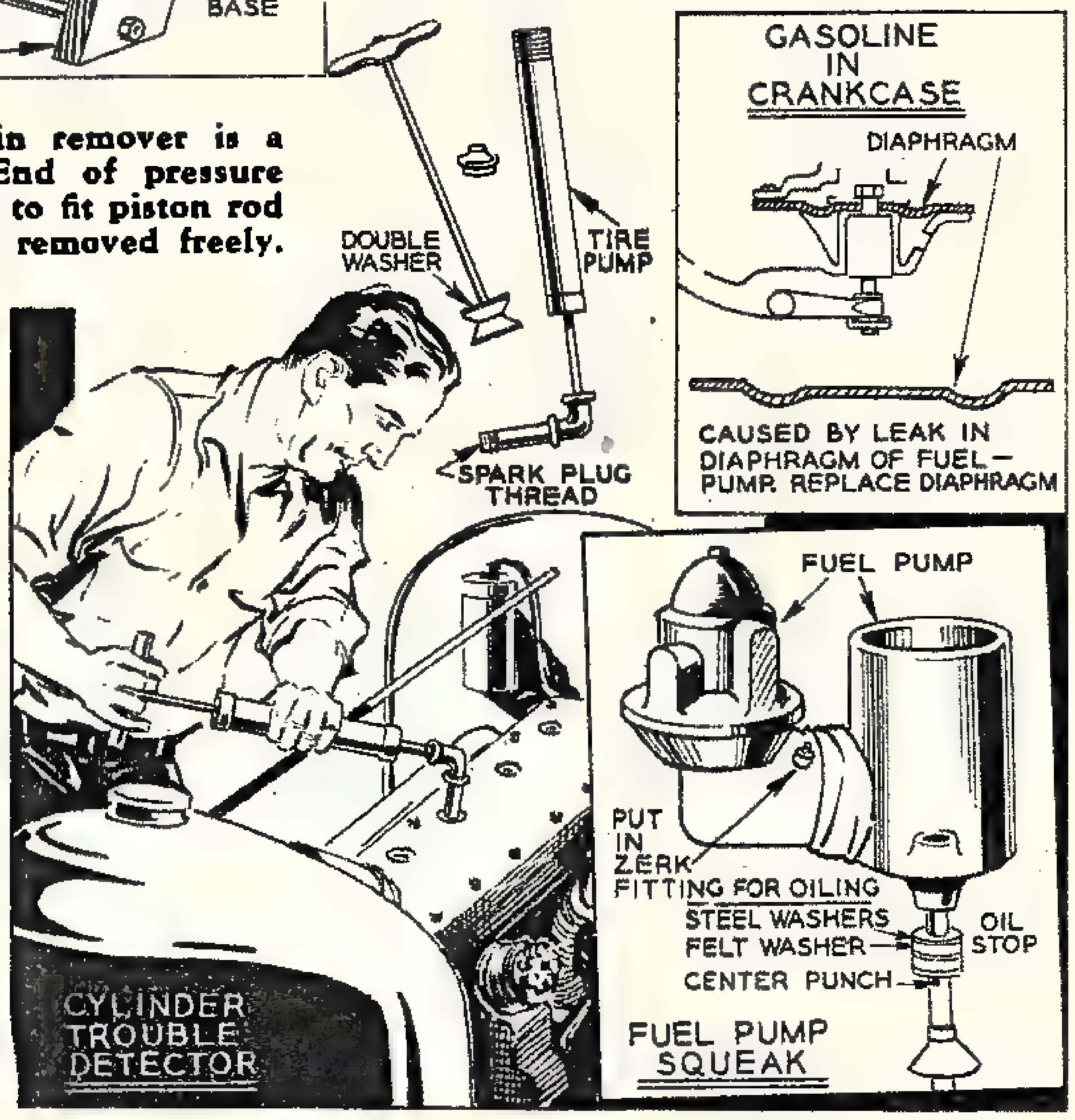
Noise caused by worn bearings can usually be detected by the loud dull sound produced. The same sound is present if they are merely loose, therefore first check for loose bolts and if the trouble is not here take the bearing apart and re-scrape it. A tool for this work can be made from a half round file which has been ground into a concave blade. A similar tool can also be fashioned from a triangular file in the manner made clear by the diagrams. After smoothing off the inside of the bearing sections smear on a thin coat of Prussian blue then re-assemble the unit.


BUSHING AND PIN REMOVER
END SIZED TO FIT BUSHING
PRESSURE SCREW
HOLE IN BASE
ROD GRIPPING JAWS

This bushing and pin remover is a handy piston tool. End of pressure screw should be sized to fit piston rod bushing so it may be removed freely.


DRY BUSHING SURFACE
BEFORE REPLACING, OIL BUSHINGS WELL

After completing the scraping of a bushing it should be well lubricated, oil being spread out with finger tips. This completed, bushing may be assembled.


DOUBLE WASHER
TIRE PUMP
SPARK PLUG THREAD
CYLINDER TROUBLE DETECTOR
GASOLINE IN CRANKCASE
DIAPHRAGM
CAUSED BY LEAK IN DIAPHRAGM OF FUEL-PUMP. REPLACE DIAPHRAGM
FUEL PUMP
PUT IN ZERK FITTING FOR OILING
STEEL WASHERS
FELT WASHER
OIL STOP
CENTER PUNCH
FUEL PUMP SQUEAK

A handy cylinder trouble detector for locating piston knocks and similar noises can be made from an old tire pump provided with double washers and threaded reducer to fit spark plug taps. Fuel pump squeaks can be eliminated as shown.

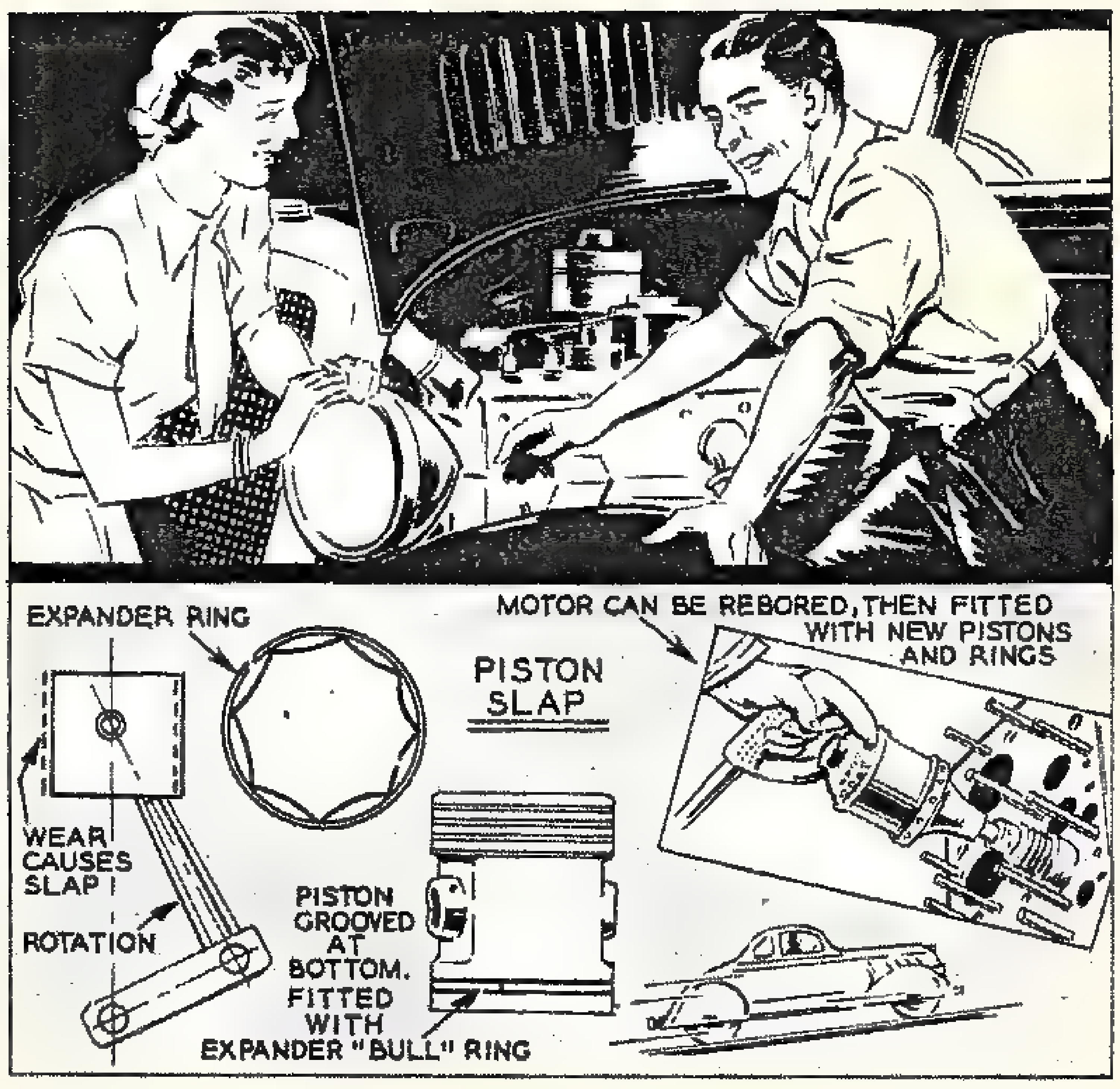
Engine NOISES

by
MORRIS A. HALL

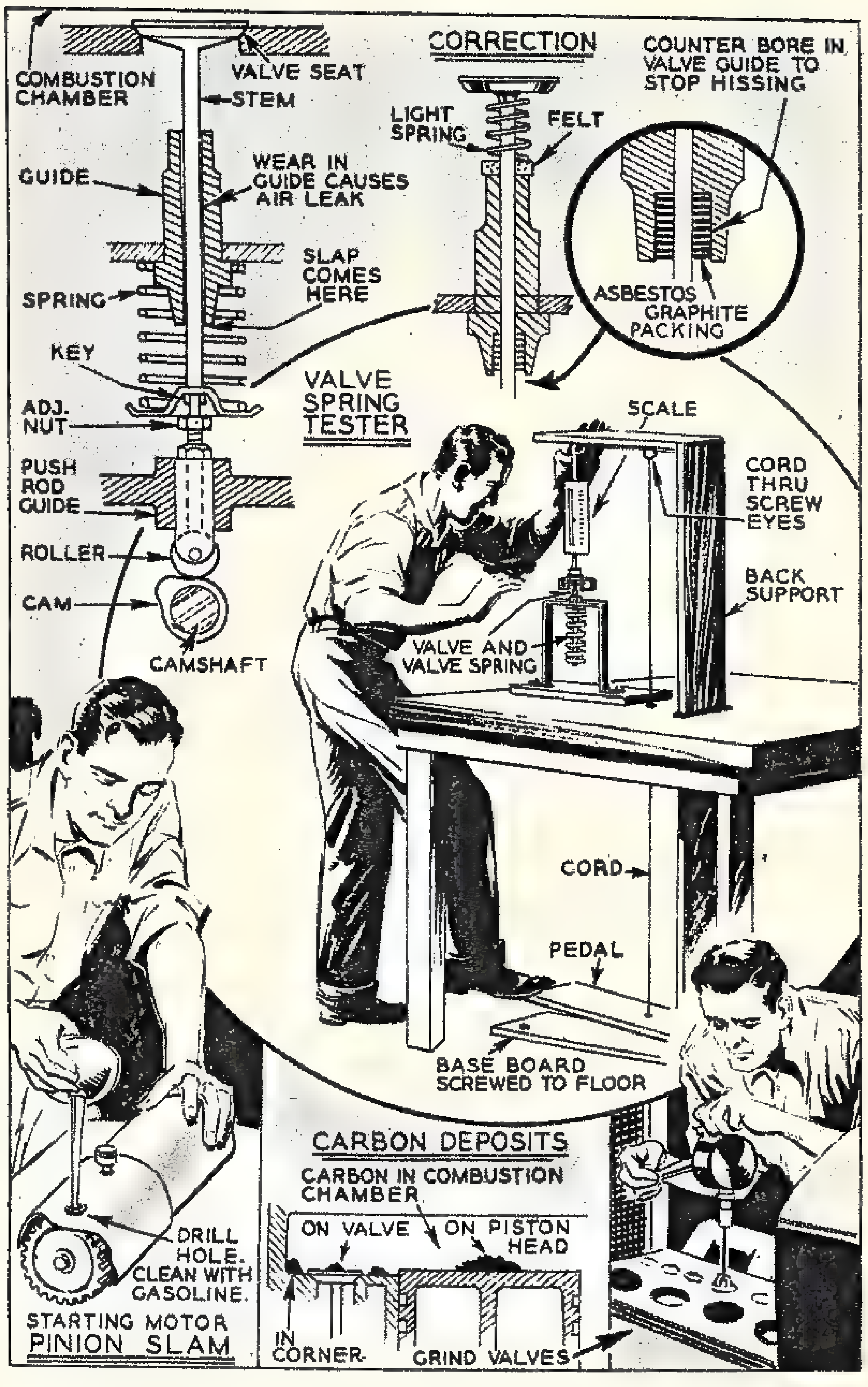
Until now only the most experienced auto mechanic could track down an elusive motor noise. This article tells how you can easily correct these annoying sounds.

Turn the shaft several times in the bearing, then open the sections. High spots will clearly show up and should be removed so that shaft turns freely.

Worn piston pins and piston rod bushings are also responsible for much of the trouble. An old pin ground down makes a handy tool for removing piston pins. A simple screw device similar to the one illustrated on this page will aid in the removal of worn bushings. Placing the entire piston in boiling water for several minutes will expand the outer metal sufficiently so that pins and bushings will come out easily.


EXPANDER RING
MOTOR CAN BE REBORED, THEN FITTED WITH NEW PISTONS AND RINGS
PISTON SLAP
WEAR CAUSES SLAP!
ROTATION
PISTON GROOVED AT BOTTOM. FITTED WITH EXPANDER "BULL" RING

Piston slap is often due to one side of the cylinder wall being worn down. The only correction for this trouble is to re-bore all cylinders to the first oversize and use new oversize piston rings. The above diagram shows the cause for pistons to slap.


COMBUSTION CHAMBER
VALVE SEAT
STEM
GUIDE
WEAR IN GUIDE CAUSES AIR LEAK
SLAP COMES HERE
SPRING
KEY
ADJ. NUT
PUSH ROD GUIDE
ROLLER
CAM
CAMSHAFT
CORRECTION
LIGHT SPRING
FELT
COUNTER BORE IN VALVE GUIDE TO STOP HISSING
ASBESTOS GRAPHITE PACKING
VALVE SPRING TESTER
SCALE
CORD THRU SCREW EYES
BACK SUPPORT
VALVE AND VALVE SPRING
CORD
PEDAL
BASE BOARD SCREWED TO FLOOR
CARBON DEPOSITS
CARBON IN COMBUSTION CHAMBER
ON VALVE
ON PISTON HEAD
IN CORNER
GRIND VALVES
DRILL HOLE. CLEAN WITH GASOLINE.
STARTING MOTOR PINION SLAM

All valves must have a uniform spring tension if the motor is to perform efficiently. Springs may be quickly checked on the simple spring balance device shown above. The proper adjustment of the valve tension can be determined by referring to the cross section diagram illustrated at upper left. Asbestos-graphite packing in the counter bore will eliminate valve hiss. The starter motor mechanism should never be oiled. Instead plain gasoline should be squirted into mechanism from time to time. A small hole drilled in motor housing permits access to starter spring and the unbalanced pinion for pouring gas.

Where the piston rings have caused the cylinder walls to wear rough, re-boring is necessary. For this work the proper hand drill attachments should be used to insure a perfectly true surface. When re-boring, grind out the cylinder to the first oversize and secure piston rings to fit so that there is no leakage of power.

It is easy to find the exact cause for the particular noise your car has developed by using a simple cylinder trouble detector. Secure an old auto pump and install a double washer plunger on the shaft, then fit up the end of the pump with a connection threaded to fit a spark plug tap. When a cylinder is suspected remove the plug, screw on the pump then turn over the engine until the pump handle is forced upward. By removing the pan and allowing someone to hold the rod a loose piston can be immediately detected.

In assembling the pistons be sure to lubricate the surfaces of the bearing well by applying heavy oil to the inner surfaces and smoothing out with the finger tips. The bear-

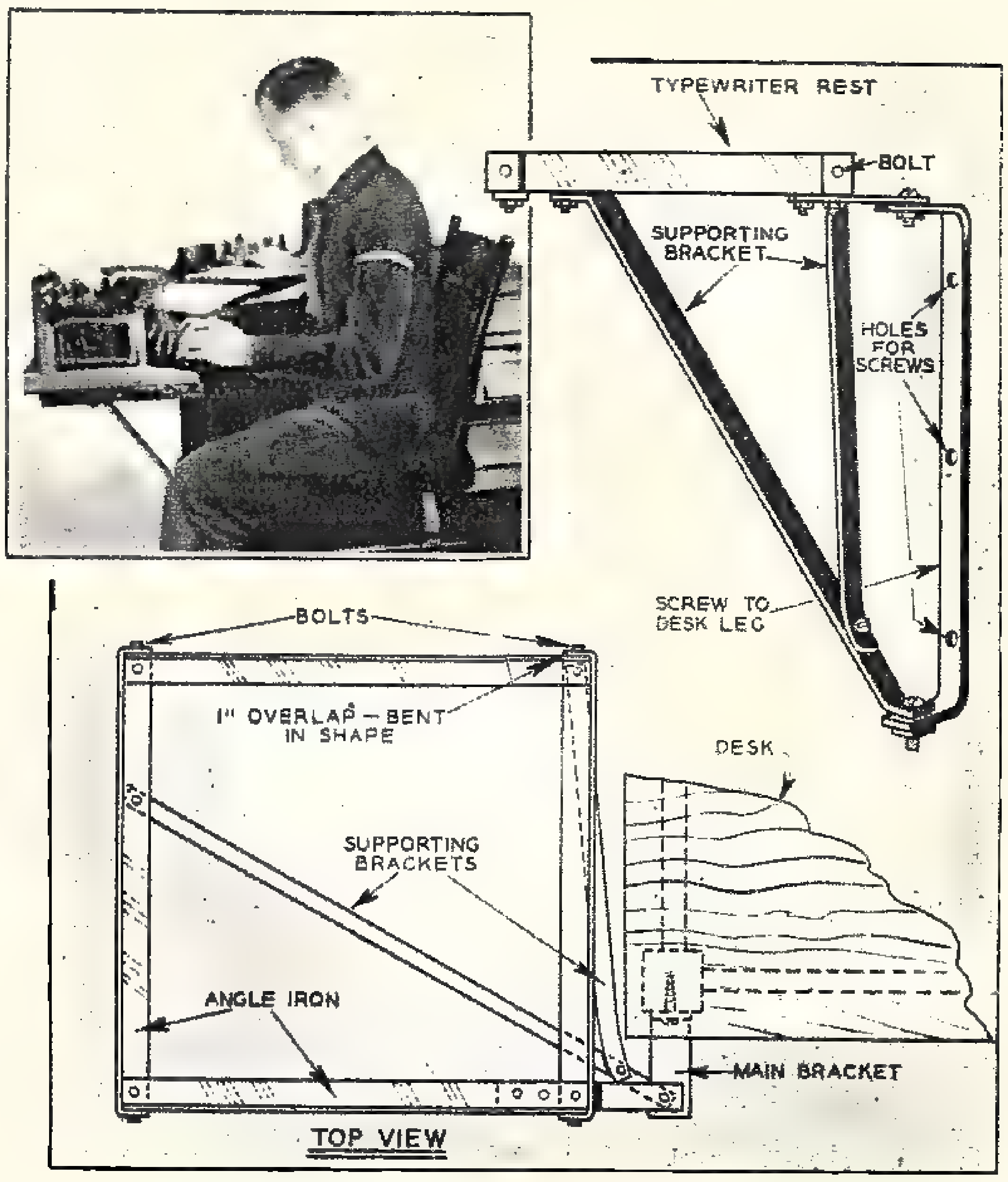
[*Continued on page* 126]

Build A Swinging Desk Stand For Your Typewriter

IN HOMES where a typewriter finds occasional use in the library or study it must usually be carried from the closet and returned each time it is used.

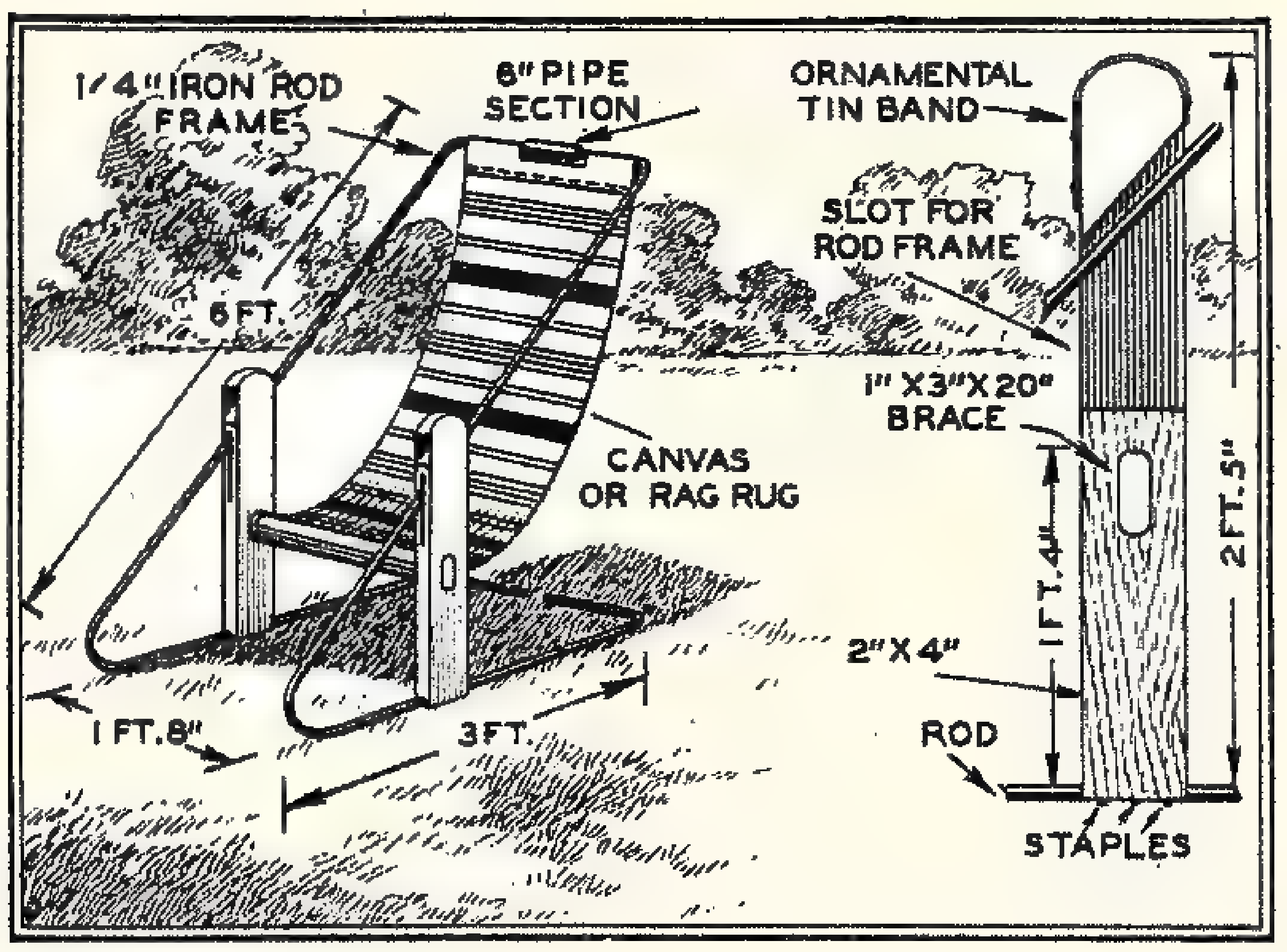
By constructing a simple swinging stand it can be permanently installed and pushed out of the way when not in use. The stand can be built for about one dollar.

Make the dimensions to suit your own requirements with the top of the stand just large enough for the typewriter feet to fit snugly into each corner. The bracket to which the top is mounted is of 1¼"x¼" stock bent to shape as shown in the diagram. Attach the bracket to the top with machine bolts then form the "C" support and attach this to the desk with wood screws. Two machine bolts serve as the pins on which the stand swings.


TYPEWRITER REST
BOLT
SUPPORTING BRACKET
HOLES FOR SCREWS
SCREW TO DESK LEG
BOLTS
1" OVERLAP — BENT IN SHAPE
SUPPORTING BRACKETS
ANGLE IRON
DESK
MAIN BRACKET
TOP VIEW

Constructed of inexpensive strap and angle iron, this typewriter stand offers a new convenience to home craftsmen or students. Assemble with bolts and attach to desk with screws.

Modern Lawn Chair Easily Built


1/4" IRON ROD FRAME
6" PIPE SECTION
ORNAMENTAL TIN BAND
SLOT FOR ROD FRAME
6FT.
1" X3"X20" BRACE
CANVAS OR RAG RUG
2 FT.5"
1 FT.4"
2"X4"
1 FT.8"
3FT.
ROD
STAPLES

Made from lengths of iron or steel rods, a piece of awning canvas and two-by-four wood supports the lawn chair above is an interesting and practical summer project for the workshop.

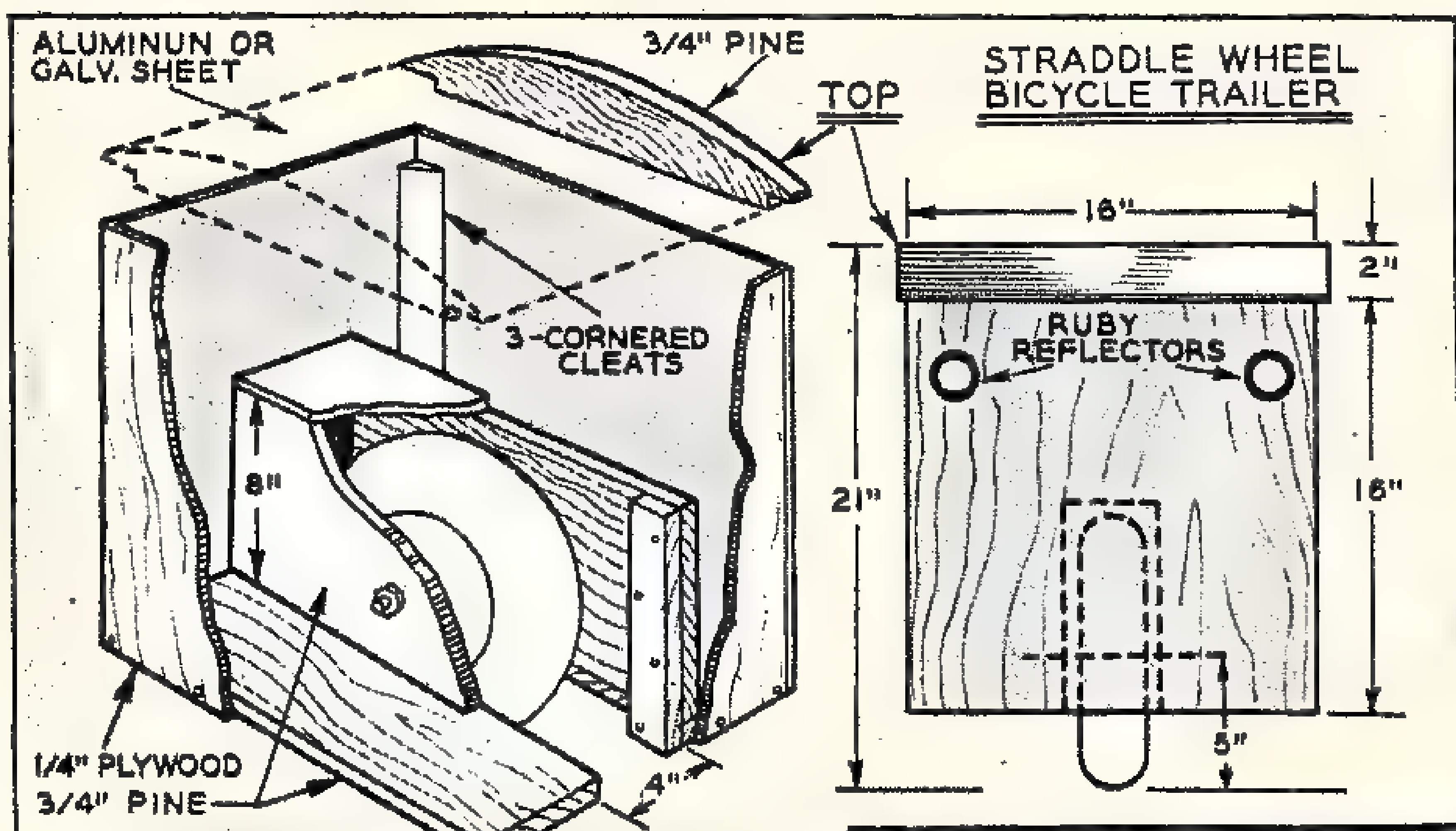
TWO lengths of scrap iron rod ¼" in diameter, a six-foot length of 2"x4" and some bright awning canvas form the materials necessary for building this comfortable lawn chair. Bend the iron rods to the shape shown in the illustration, joining the top section with a six-inch length of gas pipe. Cut the 2"x4" into two pieces and shape them accordingly. A brace extending across the 2"x4"s forms a rigid support for the chair. Attach the colored canvas to the top of the pipe frame and to the crosspiece. The frame is painted in bright red and silver bronze. Bronze all metal parts and apply two coats of enamel to the wood construction. Strips of tin or chrome tacked over the 2"x4"s as indicated add to the chair's attractiveness.

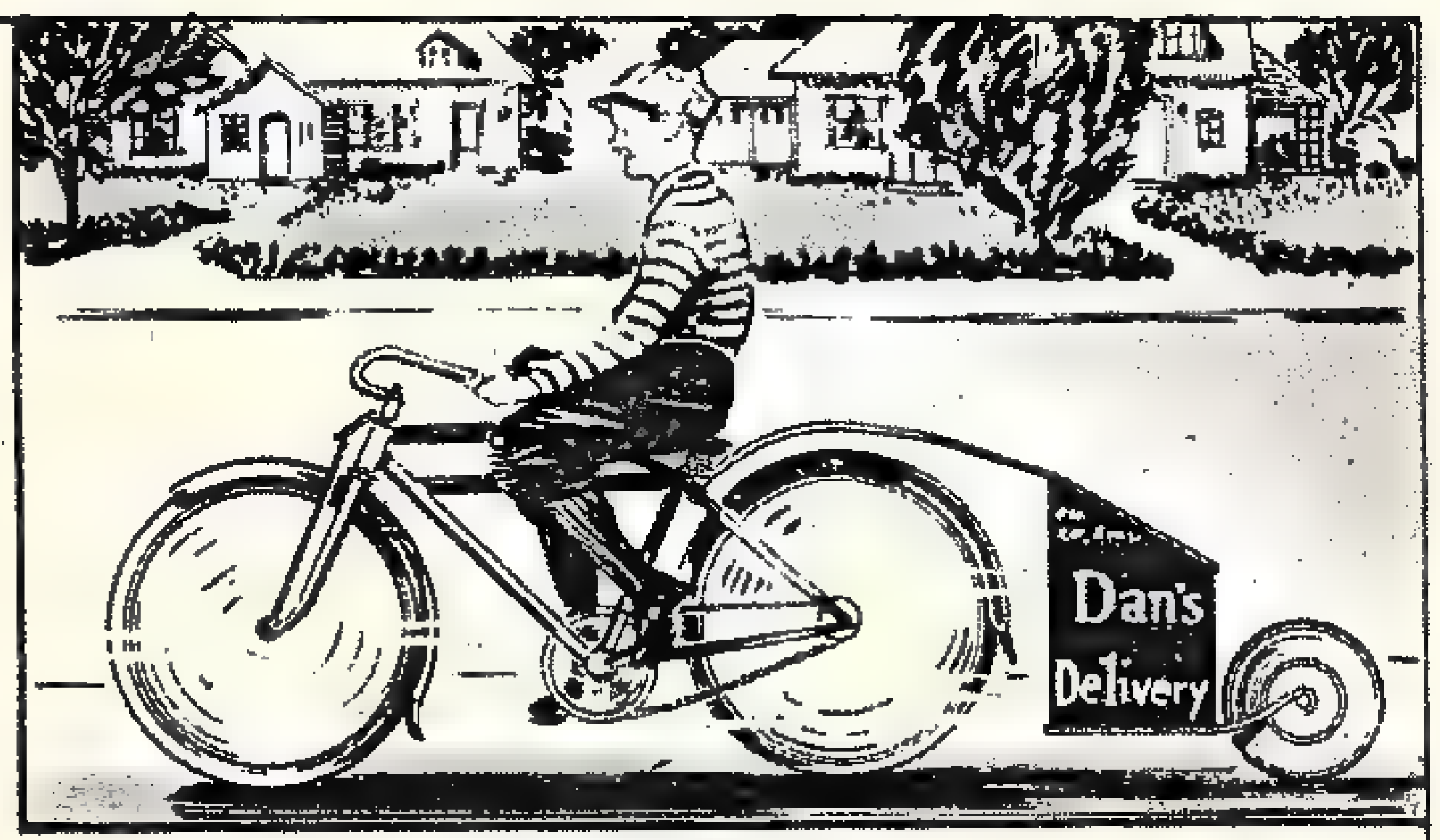
Light Socket Forms Handy Switch

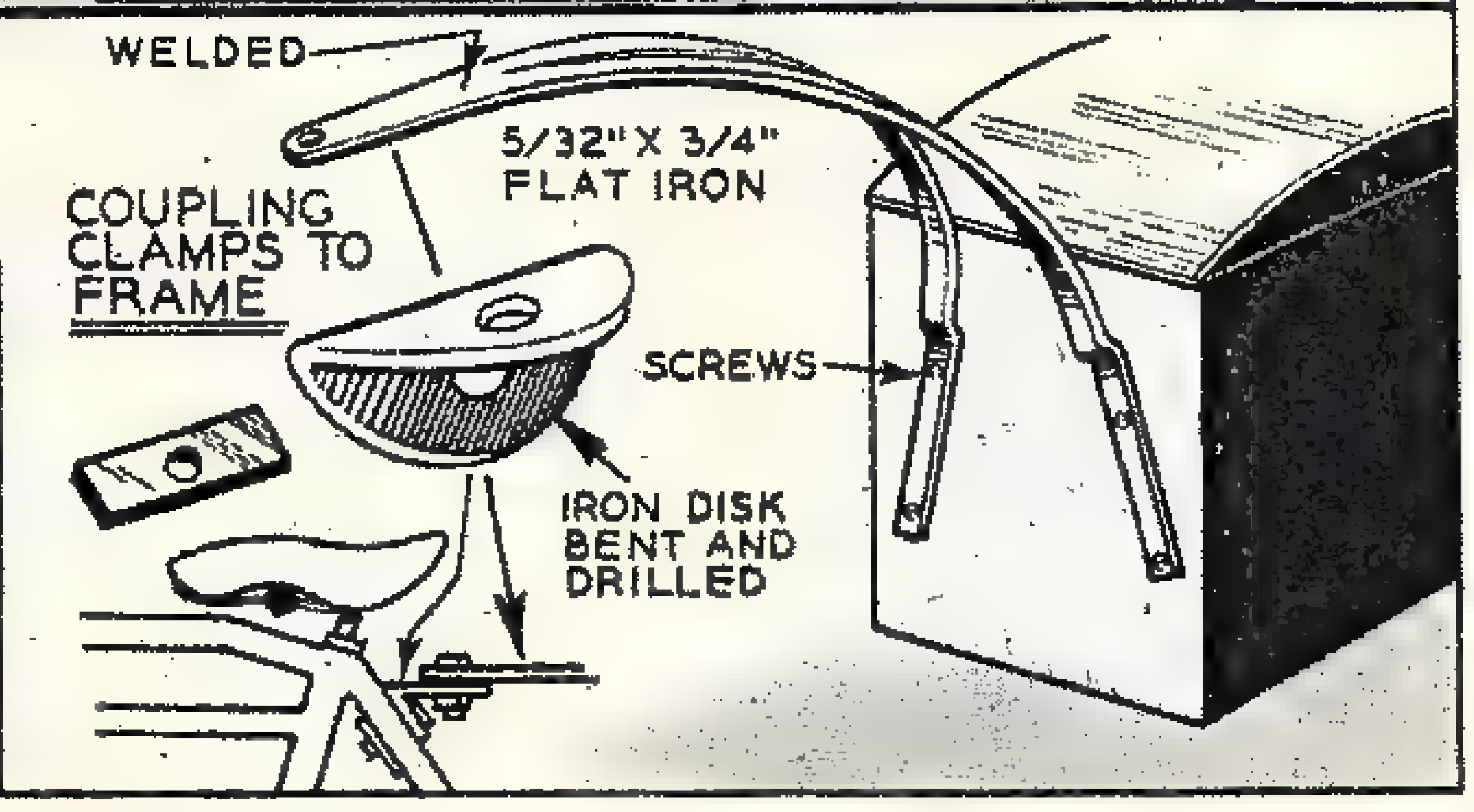
ANY porcelain cleat socket can be made into a useful foot switch for operating power tools. To a wooden button attach a strip of copper for a contact and wind a spring from stiff wire. Insert the button in the socket, mount socket in a wooden base filled with molten wax and the switch is ready for use.

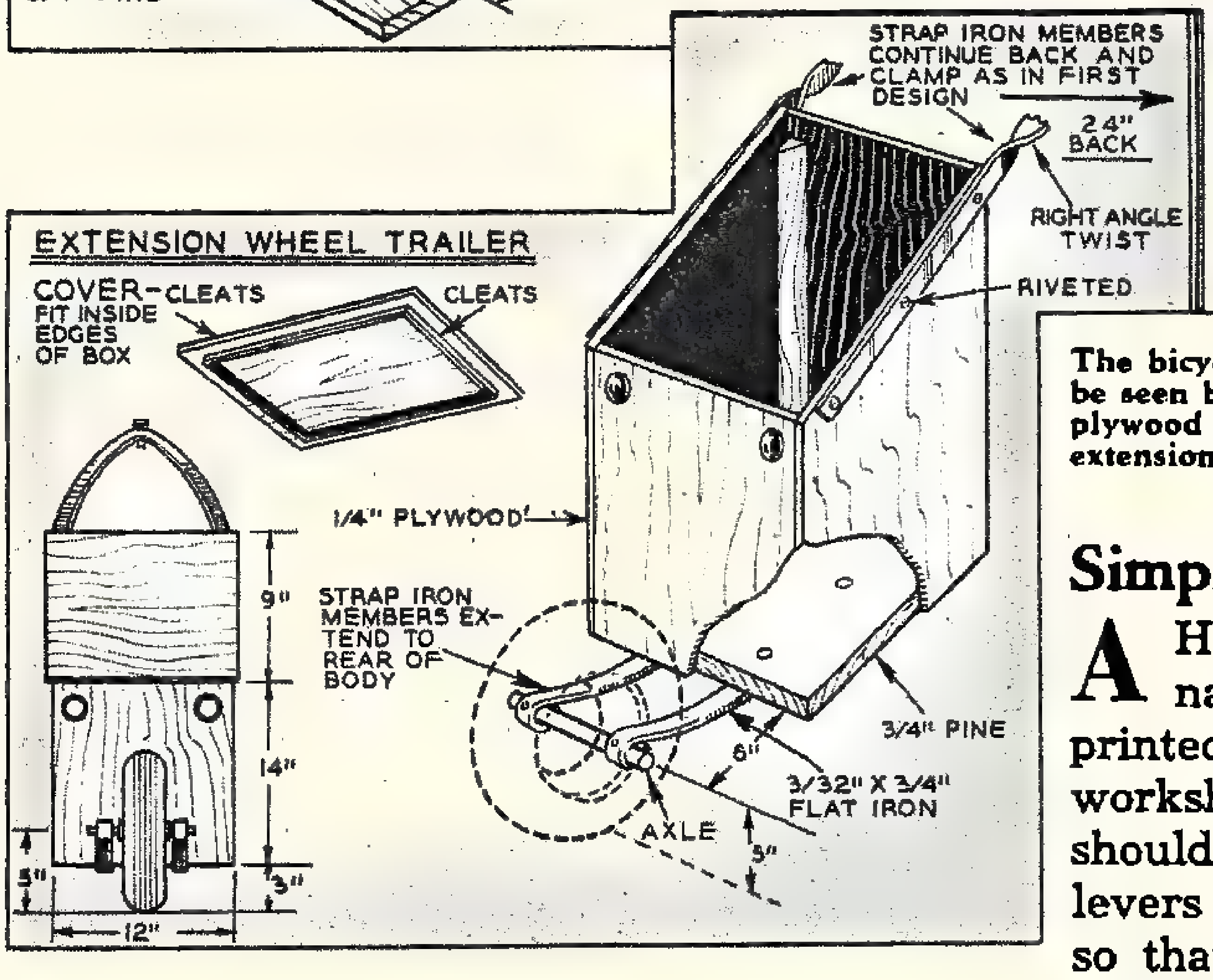
An ordinary porcelain light socket, in which has been mounted a spring brass push button, similar to the one shown here, makes a practical foot operated switch for controlling home shop machines.

Handy Trailers Speed Bicycle Deliveries


ALUMINUN OR GALV. SHEET
3/4" PINE
TOP
STRADDLE WHEEL BICYCLE TRAILER
3-CORNERED CLEATS
8"
1/4" PLYWOOD
3/4" PINE
4"
16"
2"
RUBY REFLECTORS
21"
16"
5"


Dan's Delivery


WELDED
5/32" X 3/4" FLAT IRON
COUPLING CLAMPS TO FRAME
SCREWS
IRON DISK BENT AND DRILLED


STRAP IRON MEMBERS CONTINUE BACK AND CLAMP AS IN FIRST DESIGN
24" BACK
RIGHT ANGLE TWIST
RIVETED
EXTENSION WHEEL TRAILER
COVER-FIT INSIDE EDGES OF BOX
CLEATS
CLEATS
1/4" PLYWOOD
9"
STRAP IRON MEMBERS EXTEND TO REAR OF BODY
14"
3/4" PINE
6"
3/32" X 3/4" FLAT IRON
AXLE
5"
5"
3"
12"

The bicycle trailers shown here need little explanation as can be seen by the above illustrations. Make the trailer boxes of plywood and mount the doenut airwheel in either straddle or extension fashion. Two forms of wheel suspension are shown.

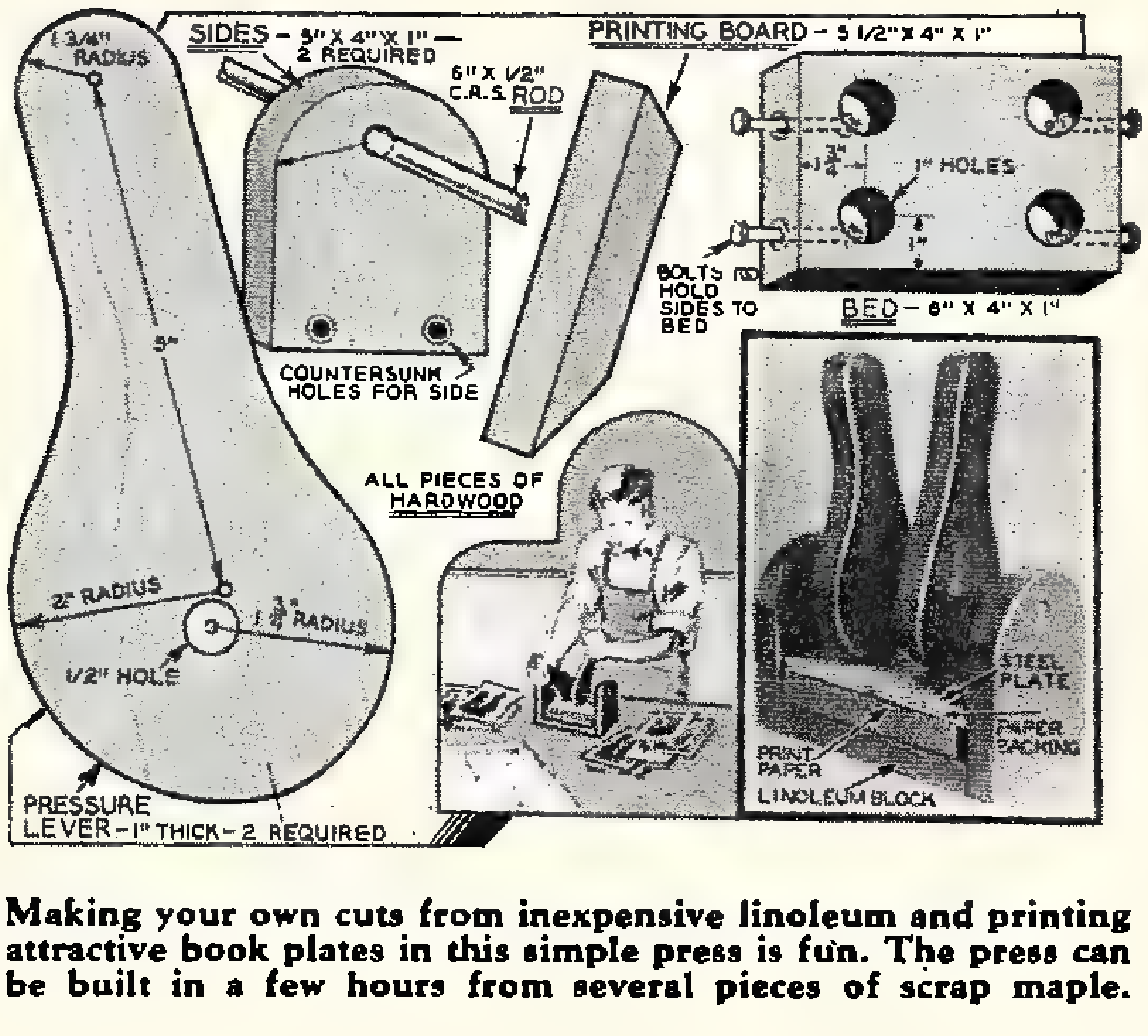
FOR the youth who does the neighborhood chores a bicycle trailer will prove of much assistance in hauling ice and groceries. Both trailers described here employ a single wheel making it possible for them to follow narrow paths. With the conventional two-wheel trailer this is not possible.

The builder has a choice of wheel mountings, in making the trailer, which best suits his requirements. One trailer features the straddle wheel while the other offers more carrying space, but has the wheel mounting projecting in the rear.

In constructing the straddle wheel trailer first make a plywood box measuring 16 inches square with a well allowed in the center for the doenut air wheel. Make the towing bar from two lengths of strap iron welded as indicated and arranged so as to fasten to the coupling located on the bicycle frame just under the saddle. The rear wheel trailer is identical to the straddle type except that parallel bars support the wheel. The completed trailers are painted in brilliant enamel.

Simple Press Prints Book Plates

A HANDY little press capable of printing name cards, book plates and other small printed matter can be constructed in the workshop in an hour or two. All wood parts should be of hard maple. The pressure levers are provided with an off-center hole so that an impression can be readily made from a linoleum block or wood cut. After applying printers ink to the face of the cut insert it in the bed of the press face up. The paper to be printed should be moist for best results. Place this over the cut followed by the paper backing and last a steel plate. Pulling the levers makes the printed impression.


3/4" RADIUS
SIDES - 5" X 4" X 1" - 2 REQUIRED
6" X 1/2" C.R.S. ROD
PRINTING BOARD - 5 1/2" X 4" X 1"
1" HOLES
BOLTS HOLD SIDES TO BED
BED - 6" X 4" X 1"
5"
COUNTERSUNK HOLES FOR SIDE
ALL PIECES OF HARDWOOD
2" RADIUS
1 3/4" RADIUS
1/2" HOLE
PRESSURE LEVER - 1" THICK - 2 REQUIRED
STEEL PLATE
PAPER BACKING
PRINT PAPER
LINOLEUM BLOCK

Making your own cuts from inexpensive linoleum and printing attractive book plates in this simple press is fun. The press can be built in a few hours from several pieces of scrap maple.

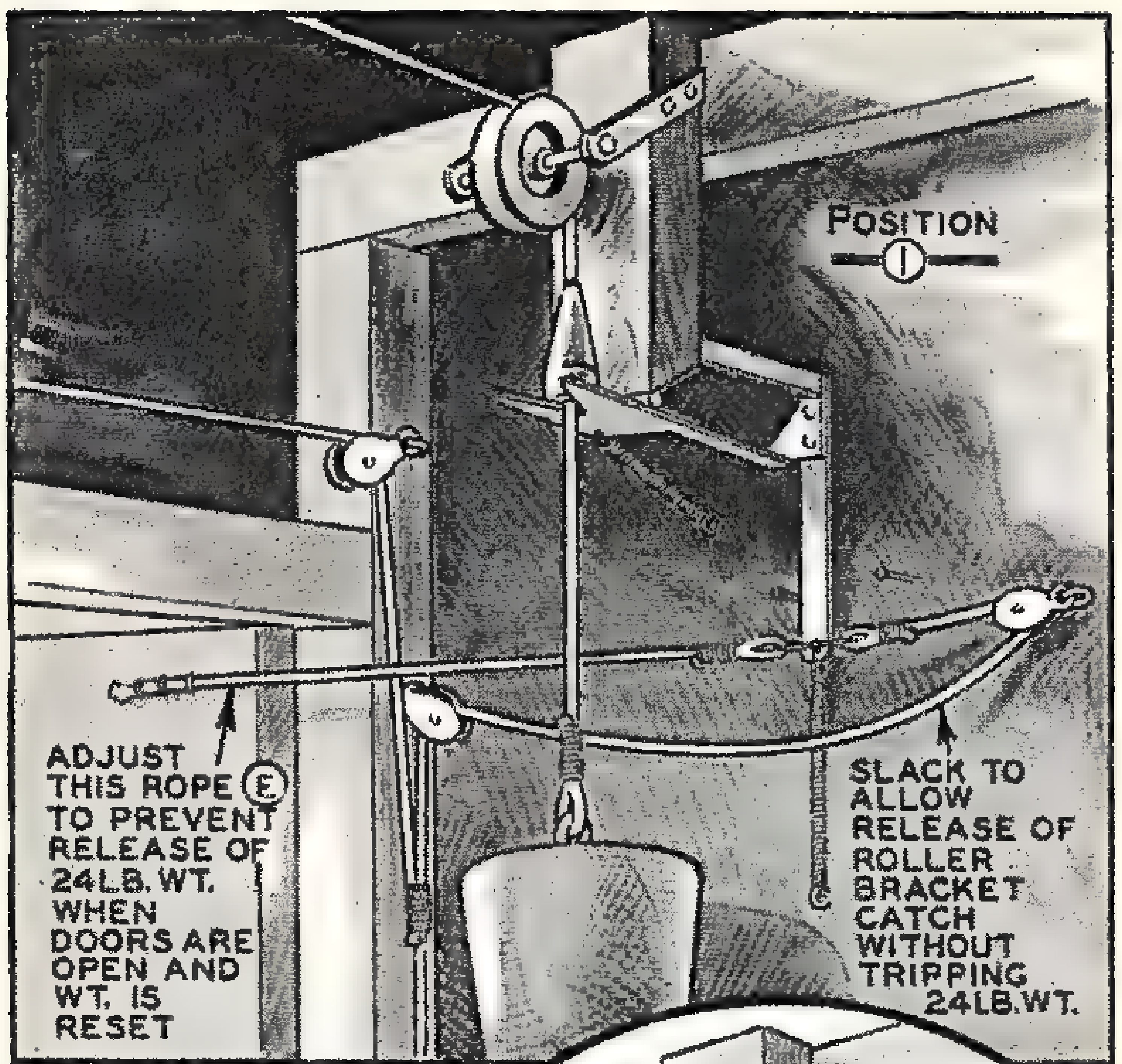
PULL-CORD CONTROL OPENS

HERE'S a simple, automatic garage door control with which you may close your garage doors as you drive out and open them without leaving the car when you are ready to drive in.

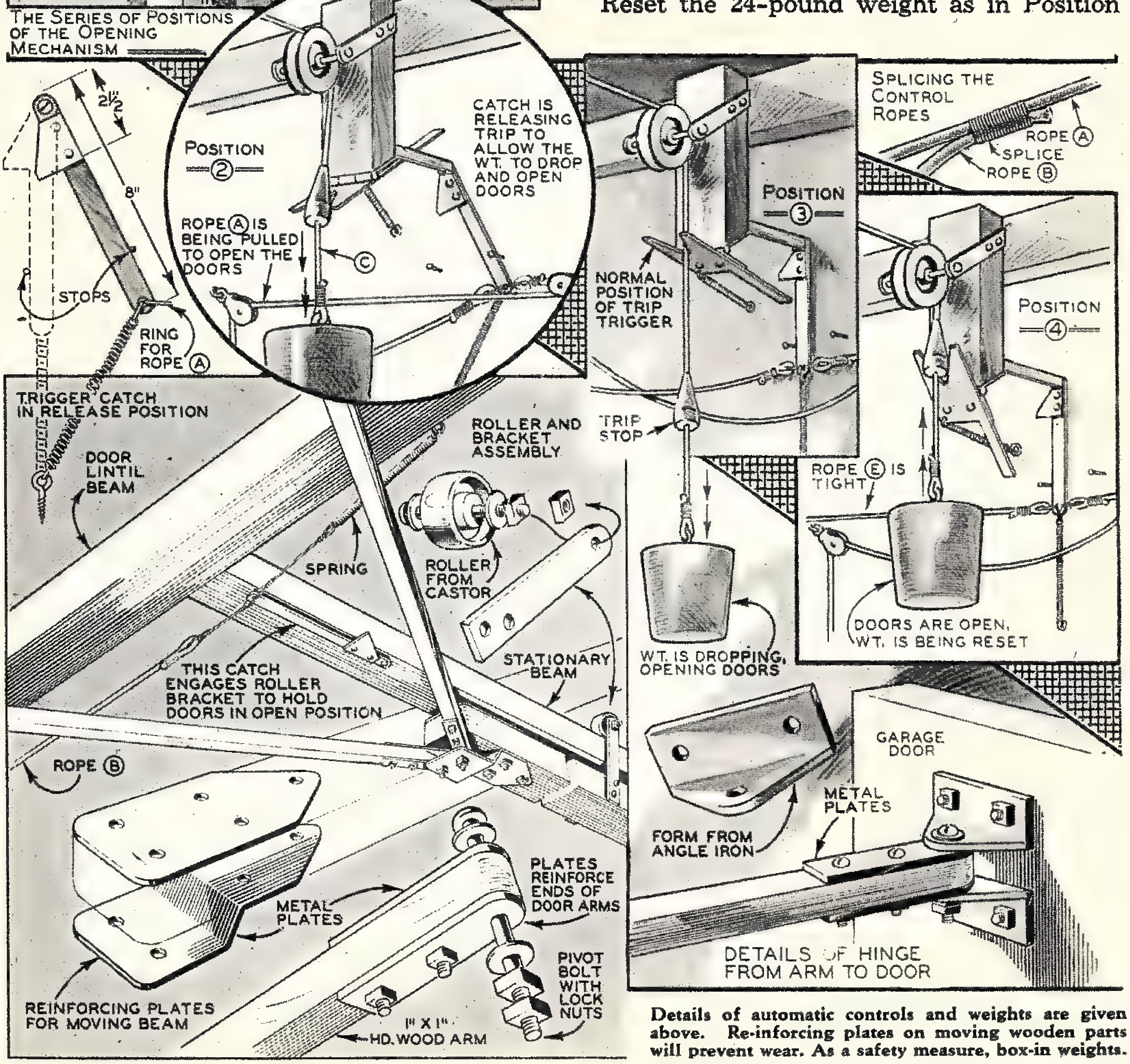
The illustrations explain clearly, the construction of the various mechanisms required in the construction.

When the doors of the garage are closed, a pull on the control rope "A" releases the 24-pound weight as in Position 2. The weight opens the doors and the catch on the stationary beam engages the first roller bracket on the movable beam which holds the doors firmly in a wind. The catch on the stationary beam is placed so that the movable beam will project about 18 inches beyond the door frame in full open position.

Reset the 24-pound weight as in Position


POSITION ①
ADJUST THIS ROPE Ⓔ TO PREVENT RELEASE OF 24LB. WT. WHEN DOORS ARE OPEN AND WT. IS RESET
SLACK TO ALLOW RELEASE OF ROLLER BRACKET CATCH WITHOUT TRIPPING 24LB.WT.

THE SERIES OF POSITIONS OF THE OPENING MECHANISM


2½"
8"
STOPS
RING FOR ROPE Ⓐ
TRIGGER CATCH IN RELEASE POSITION
DOOR LINTIL BEAM
POSITION ②
CATCH IS RELEASING TRIP TO ALLOW THE WT. TO DROP AND OPEN DOORS
ROPE Ⓐ IS BEING PULLED TO OPEN THE DOORS
Ⓒ
POSITION ③
NORMAL POSITION OF TRIP TRIGGER
TRIP STOP
SPLICING THE CONTROL ROPES
ROPE Ⓐ
SPLICE
ROPE Ⓑ
POSITION ④
ROPE Ⓔ IS TIGHT
DOORS ARE OPEN, WT. IS BEING RESET
WT. IS DROPPING, OPENING DOORS
ROLLER AND BRACKET ASSEMBLY
ROLLER FROM CASTOR
SPRING
STATIONARY BEAM
THIS CATCH ENGAGES ROLLER BRACKET TO HOLD DOORS IN OPEN POSITION
ROPE Ⓑ
METAL PLATES
REINFORCING PLATES FOR MOVING BEAM
PLATES REINFORCE ENDS OF DOOR ARMS
PIVOT BOLT WITH LOCK NUTS
1" X 1" HD. WOOD ARM
FORM FROM ANGLE IRON
METAL PLATES
GARAGE DOOR
DETAILS OF HINGE FROM ARM TO DOOR

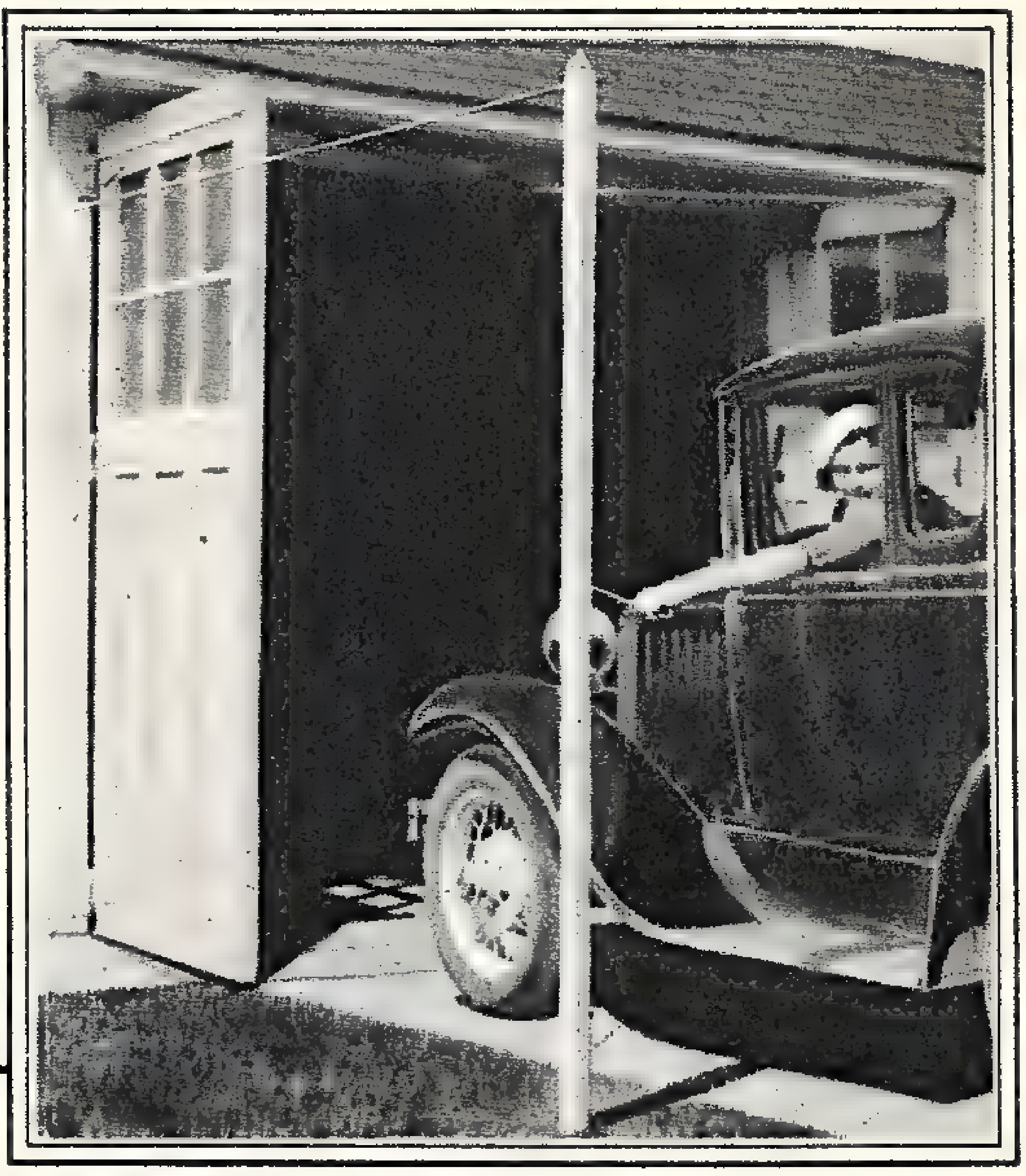
Details of automatic controls and weights are given above. Re-inforcing plates on moving wooden parts will prevent wear. As a safety measure, box-in weights.

GARAGE DOORS Automatically

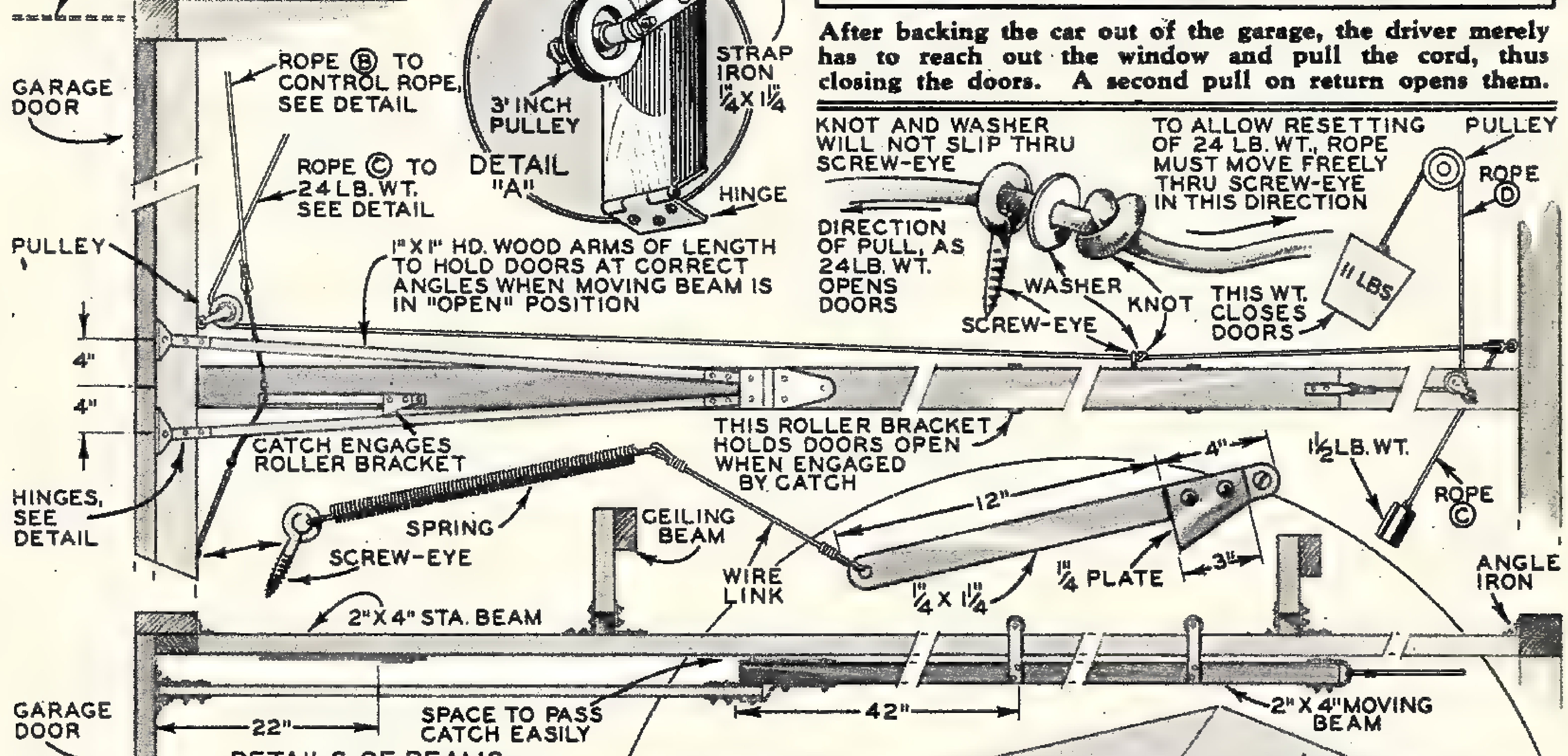
1 then drive the car out of the garage. A pull on the control rope "A" will release the catch holding the doors open, and the 11-pound weight will close the doors by its pull on the rope "D." Rope "B" is spliced to rope "'A" at the proper point to make this operation possible. It should be noted that while the doors are open, a pull on the control rope "A" will release the catch on the stationary beam, but rope "E" prevents the release of the trigger catch controlling the drop of the 24-pound weight.

You will not find it necessary to leave the car to operate the control from the time you drive out of the garage until you have driven the car into it again.

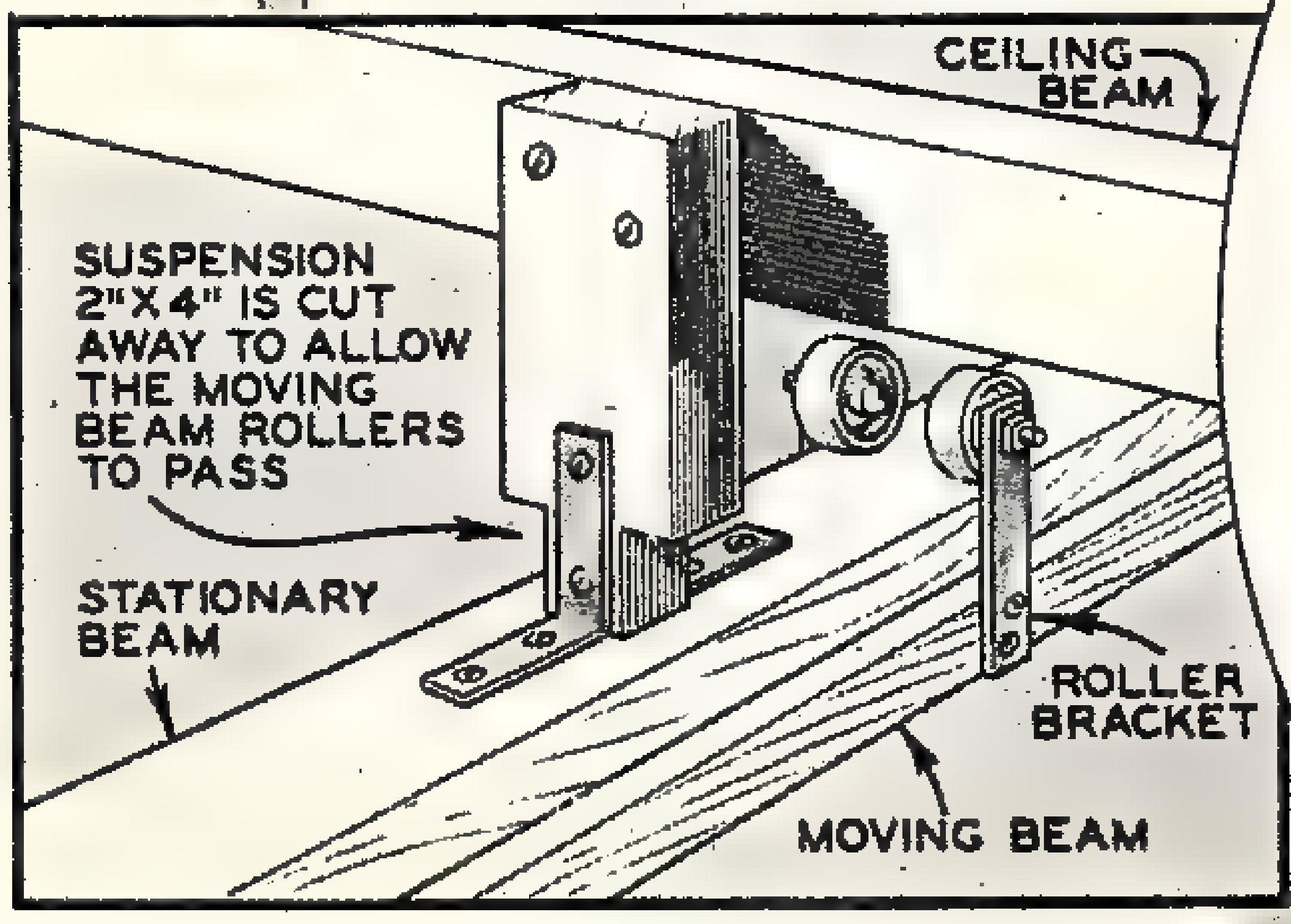
Always remember to reset the 24-pound weight each time you leave the garage, whether you are driving in or out.



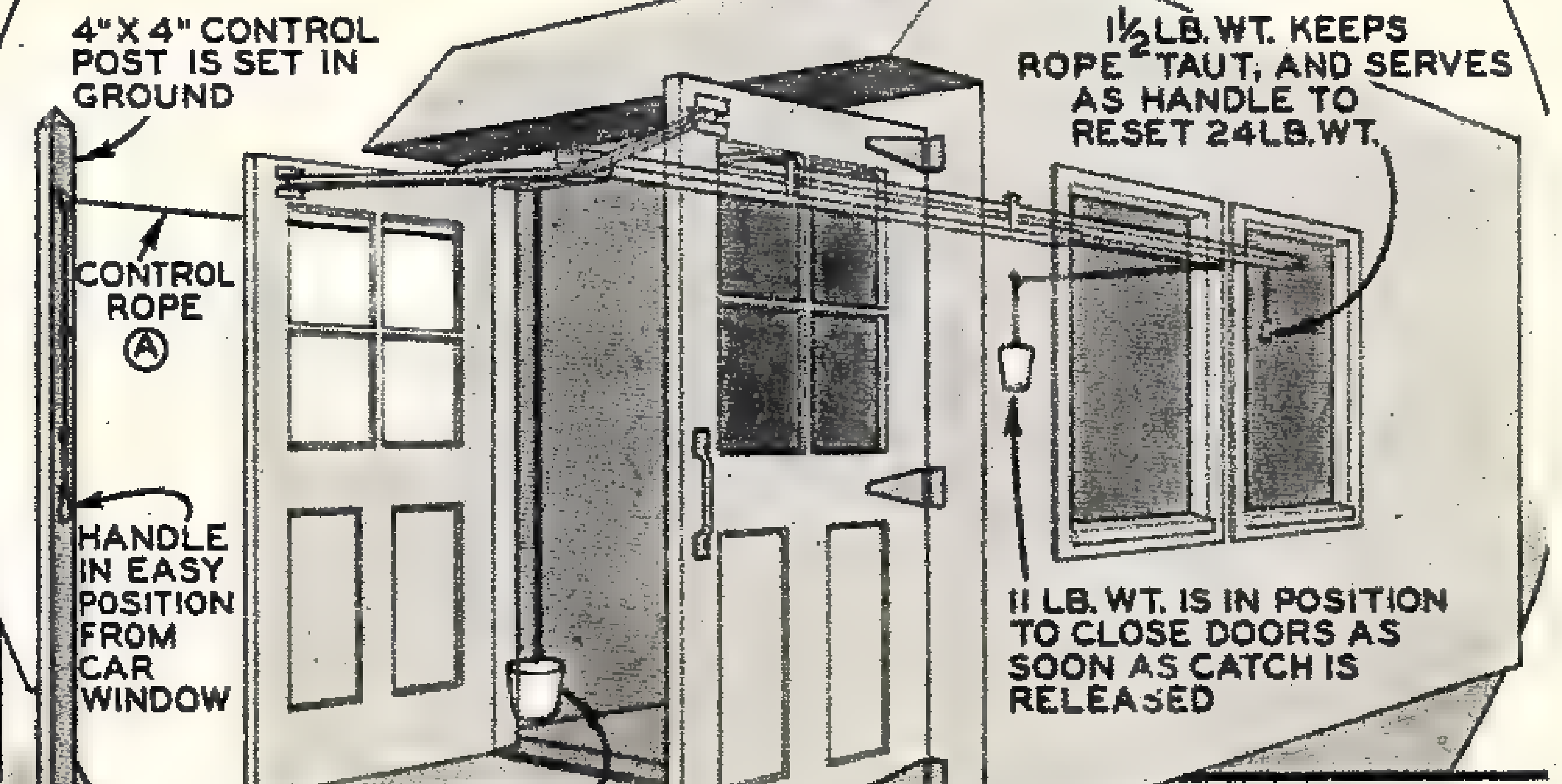
After backing the car out of the garage, the driver merely has to reach out the window and pull the cord, thus closing the doors. A second pull on return opens them.


CONTROL ROPE, TO POST
2"X 4" 15" LONG
STRAP IRON ¼X1¼
3" INCH PULLEY
DETAIL "A"
HINGE
GARAGE DOOR
ROPE Ⓑ TO CONTROL ROPE, SEE DETAIL
ROPE Ⓒ TO 24 LB. WT. SEE DETAIL
PULLEY
1"X1" HD. WOOD ARMS OF LENGTH TO HOLD DOORS AT CORRECT ANGLES WHEN MOVING BEAM IS IN "OPEN" POSITION
KNOT AND WASHER WILL NOT SLIP THRU SCREW-EYE
TO ALLOW RESETTING OF 24 LB. WT., ROPE MUST MOVE FREELY THRU SCREW-EYE IN THIS DIRECTION
PULLEY
ROPE Ⓓ
DIRECTION OF PULL, AS 24 LB. WT. OPENS DOORS
WASHER
SCREW-EYE
KNOT
THIS WT. CLOSES DOORS
11 LBS
4"
4"
HINGES, SEE DETAIL
CATCH ENGAGES ROLLER BRACKET
THIS ROLLER BRACKET HOLDS DOORS OPEN WHEN ENGAGED BY CATCH
1½LB. WT.
ROPE Ⓒ
SPRING
SCREW-EYE
CEILING BEAM
WIRE LINK
12"
4"
¼X1¼
¼ PLATE
3"
ANGLE IRON
2"X 4" STA. BEAM
GARAGE DOOR
22"
SPACE TO PASS CATCH EASILY
42"
2"X 4" MOVING BEAM

DETAILS OF BEAMS IN CLOSED POSITION–

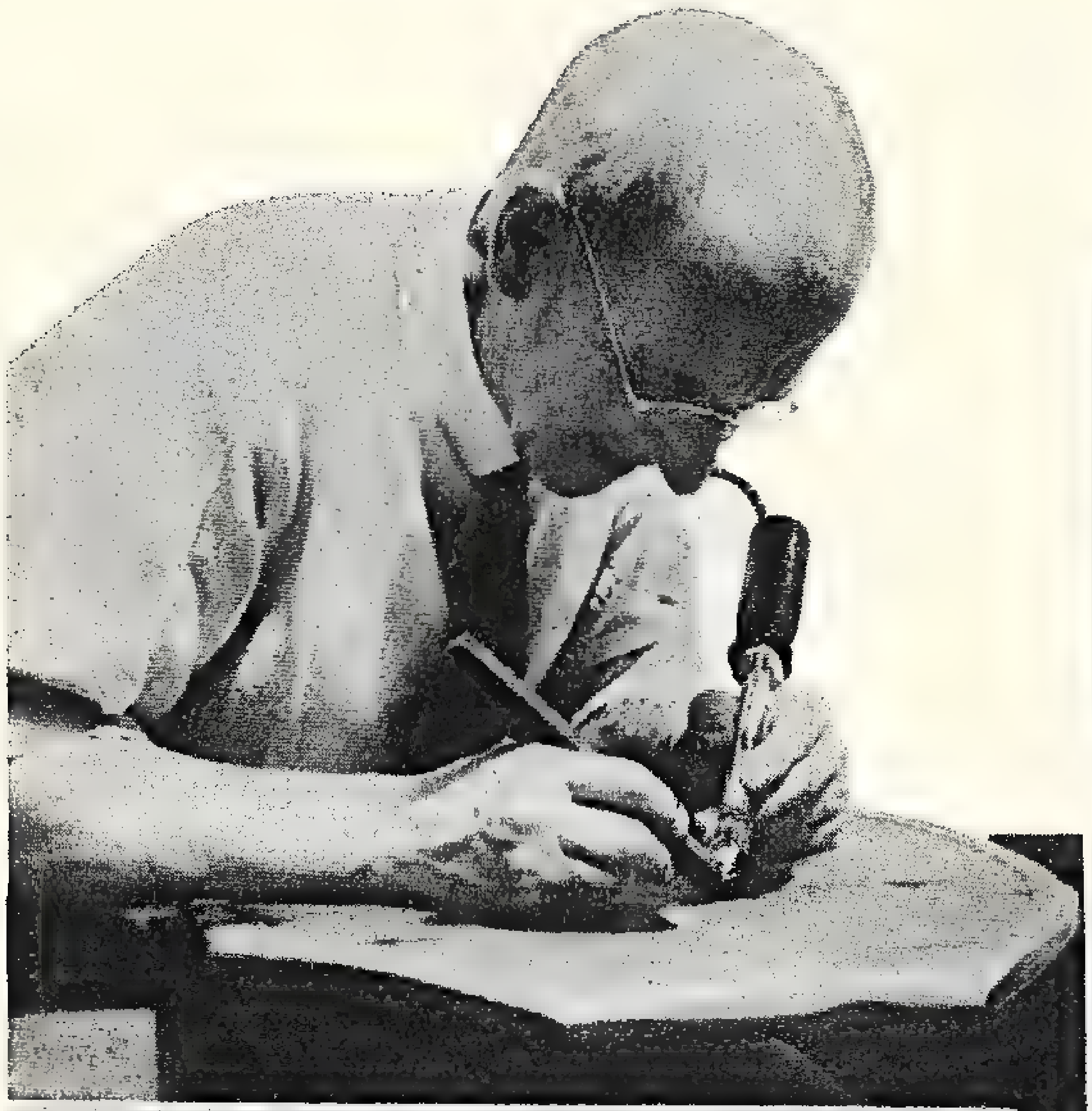

CEILING BEAM
SUSPENSION 2"X4" IS CUT AWAY TO ALLOW THE MOVING BEAM ROLLERS TO PASS
STATIONARY BEAM
ROLLER BRACKET
MOVING BEAM

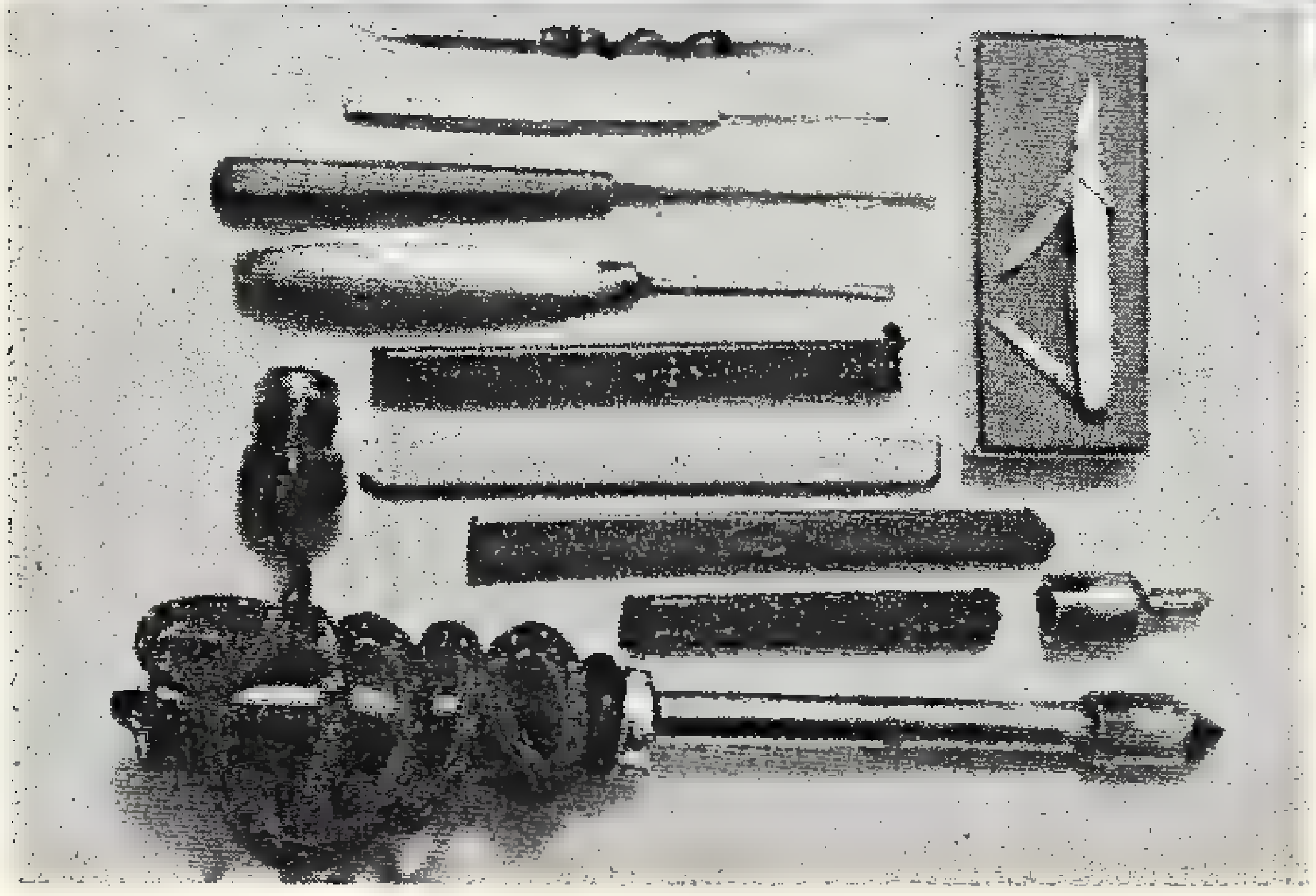
Suspension of the stationary beam is clearly illustrated. This beam runs the full length of the garage door to insure rigidity. The rollers should be kept well lubricated.

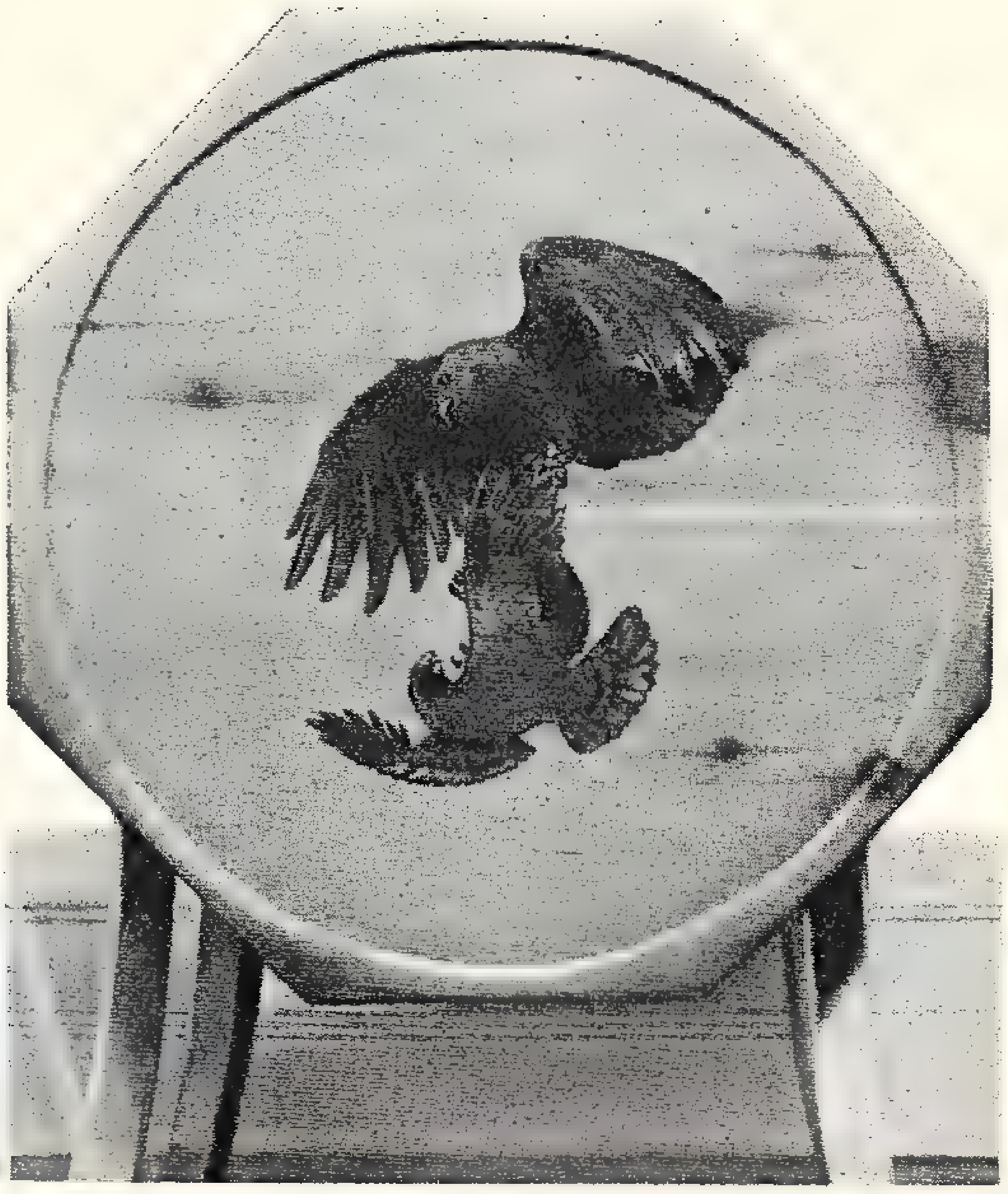

4"X4" CONTROL POST IS SET IN GROUND
1½LB. WT. KEEPS ROPE TAUT, AND SERVES AS HANDLE TO RESET 24LB. WT.
CONTROL ROPE Ⓐ
HANDLE IN EASY POSITION FROM CAR WINDOW
11 LB. WT. IS IN POSITION TO CLOSE DOORS AS SOON AS CATCH IS RELEASED
24 LB. WT. HAVING OPENED DOORS, IS IN "DOWN" POSITION

PHANTOM VIEW OF GARAGE, SHOWING THE LOCATIONS OF BEAMS, ROPES, WEIGHTS AND CONTROL POST.

Inlaying with Colored Sealing Wax







Beautiful Venetian Marquetry can be produced in the home workshop by using ordinary colored stick shellac for the inlay material. The inlay above work was done with the simple tools shown at left. Suitable designs may be traced from magazine illustrations.

by G. A. MOLECEY

WHERE the inlay artist of old set mosaics with ivory and semi-precious stones, the modern workshop fan melts stick shellac with an electric iron for his inlays. Venetian Marquetry, an art that is rapidly being lost, can be successfully reproduced in the home workshop with no particular skill required to duplicate the strength of design and delicacy in workmanship of a 15th century artisan.

As in relief wood carving, designs may be selected from magazine illustrations or drawings and traced on the wood. Tools can be minimized to an electric soldering iron, sharp short bladed pen-knife, a few chisels and, where procurable, discarded dental tools. Materials are inexpensive and include several bars of colored stick shellac, available at any paint dealer; thin tracing paper, white office or wall paper paste, a pencil, two or three bottles of waterproof ink in various colors and a small water color paint brush.

Marquetry, or inlay work, of this type is particularly adaptable to decorating cedar chest lids, wood panels, checker boards and table tops. In making a small table head design similar to the one shown here, select kiln dried stock of cedar, mahogany, basswood or oak and finish the surface to a satin smoothness.

This done trace the design selected on thin tracing paper. The picture, "Birds In Combat," used on the original project was traced from a color plate illustration in a bird book.

The tracing completed, brush a thin coat of paste on to the wood and lay the paper over it. Center the design so the longer cuts will follow the grain as much as possible., Make sure the tracing is pasted down absolutely smooth and free of wrinkles then set aside to dry thoroughly.

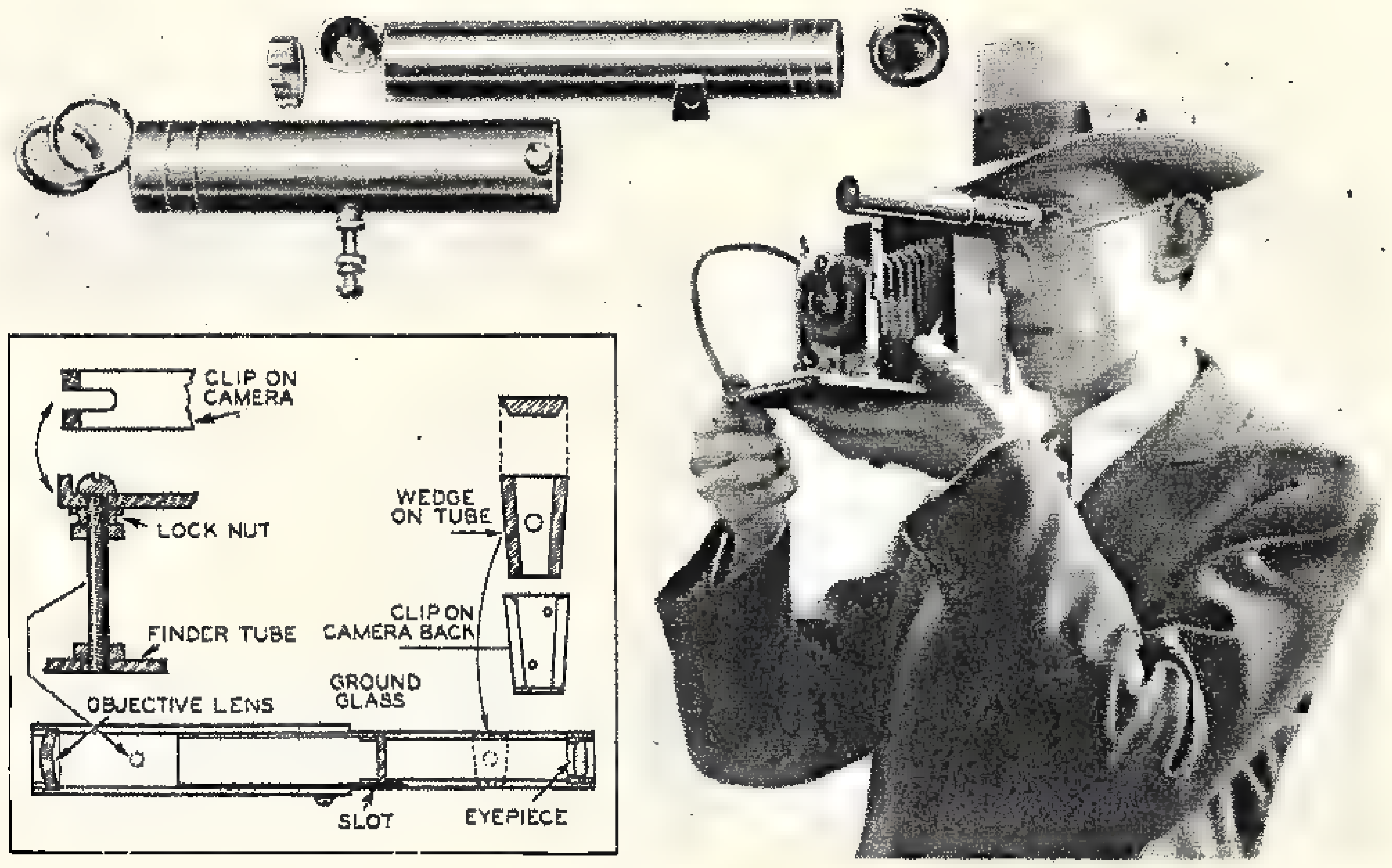
Cut over the tracing through the paper and into the wood to a depth of approximately one-eighth of an inch with a razor sharp penknife. After checking the tracing

[*Continued on page* 124]

Telescopic Finder Improves Camera Pictures

IF YOUR camera depends upon a scale focusing device the chances are that many pictures are ruined because you are a poor judge of distance. By using a focus finder on the camera all chance of errors will be eliminated since the finder automatically sets the camera bellows to the proper focus.

Make the telescopic unit from aluminum or brass tubing and install an objective lens of the same focal length as the camera lens in one end of the large tube. In the smaller tube insert a ground glass so that it will be in a position equal to the focal length of the objective lens. About two inches in back of the ground glass and at the end of the smaller tube mount a small magnifying lens for an eyepiece. Attach a wedge catch to the smaller tube and a bolt to the larger tube for mounting to the camera.


CLIP ON CAMERA
LOCK NUT
FINDER TUBE
OBJECTIVE LENS
WEDGE ON TUBE
CLIP ON CAMERA BACK
GROUND GLASS
SLOT
EYEPIECE

This telescopic attachment will insure your camera taking sharp pictures. Turn down tubes from brass or use pre-formed aluminum tubing. Finder is brought into focus by adjusting camera bellows until object is sighted.

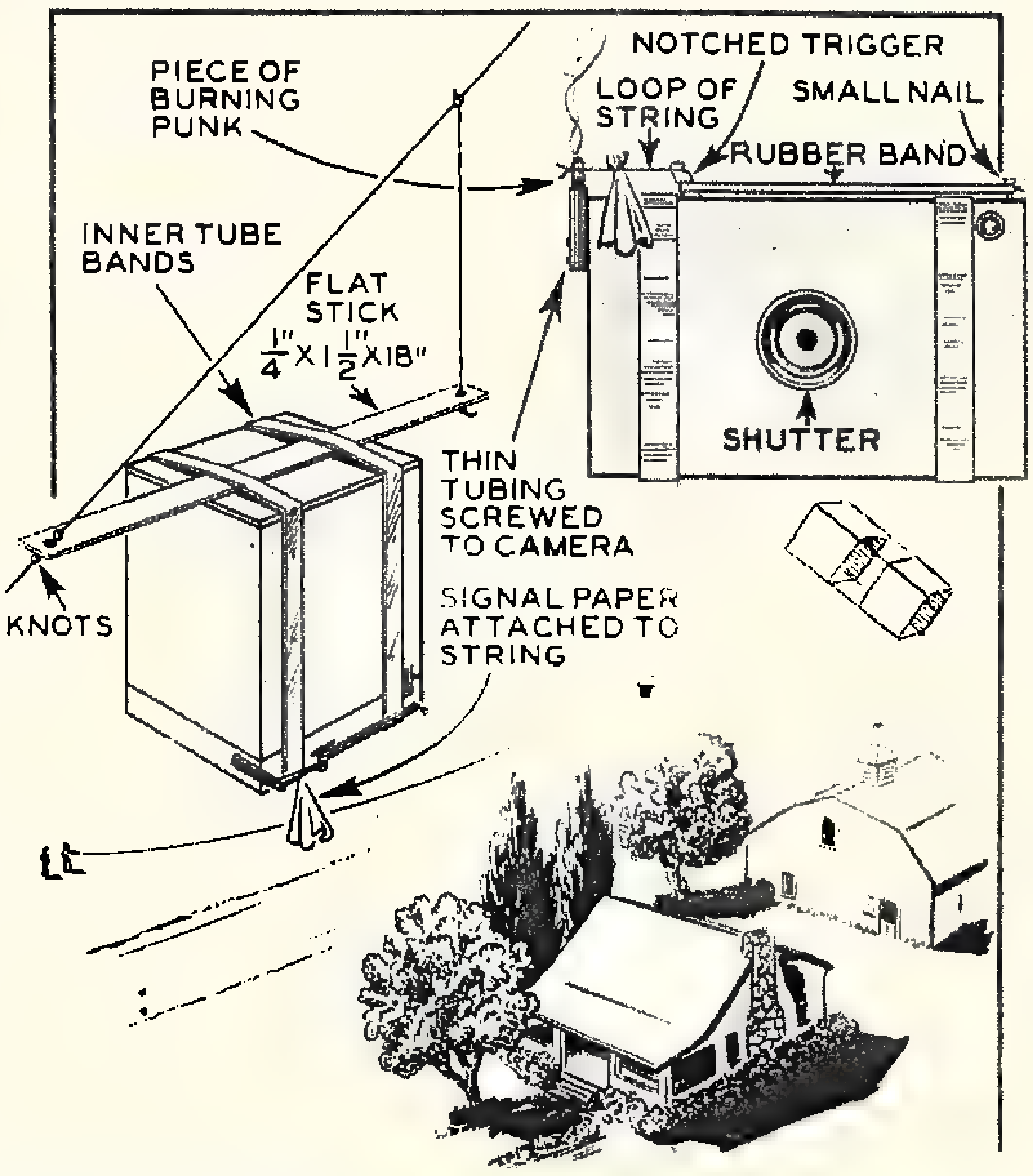
Film Pack Serves As Novel Printer

Using a film pack as an emergency printing frame is accomplished as pictured above. Take film pack apart, insert a glass over opening, then the printing paper and finally spring back.

THE metal parts of a film pack can be quickly converted into an emergency printing frame. Take the metal casing of the pack apart and lay a piece of clean glass over the film window. On this lay the negative followed by the sensitive printing paper and on this a stiff piece of cardboard or fiber for backing. Replace the rest of the film pack so that spring strips will hold the paper and film in close contact. While this arrangement is at best a makeshift affair it will prove helpful when a suitable printing frame is not available. Old film packs may also be cut apart with tin shears and used as printing masks.

Box Camera Takes Aerial Photos

AN ORDINARY dollar box camera attached to a suitable kite will make excellent aerial photos. To the camera attach a small metal clip for holding a piece of Chinese punk. Slip a thread loop around the punk and camera shutter release and a rubber band from the release to a small tack on the opposite side so that the burning punk will eventually burn the thread and snap the picture. Camera is suspended from kite string.


PIECE OF BURNING PUNK
NOTCHED TRIGGER
LOOP OF STRING
SMALL NAIL
RUBBER BAND
INNER TUBE BANDS
FLAT STICK 1/4"X1 1/2"X18"
SHUTTER
THIN TUBING SCREWED TO CAMERA
SIGNAL PAPER ATTACHED TO STRING
KNOTS

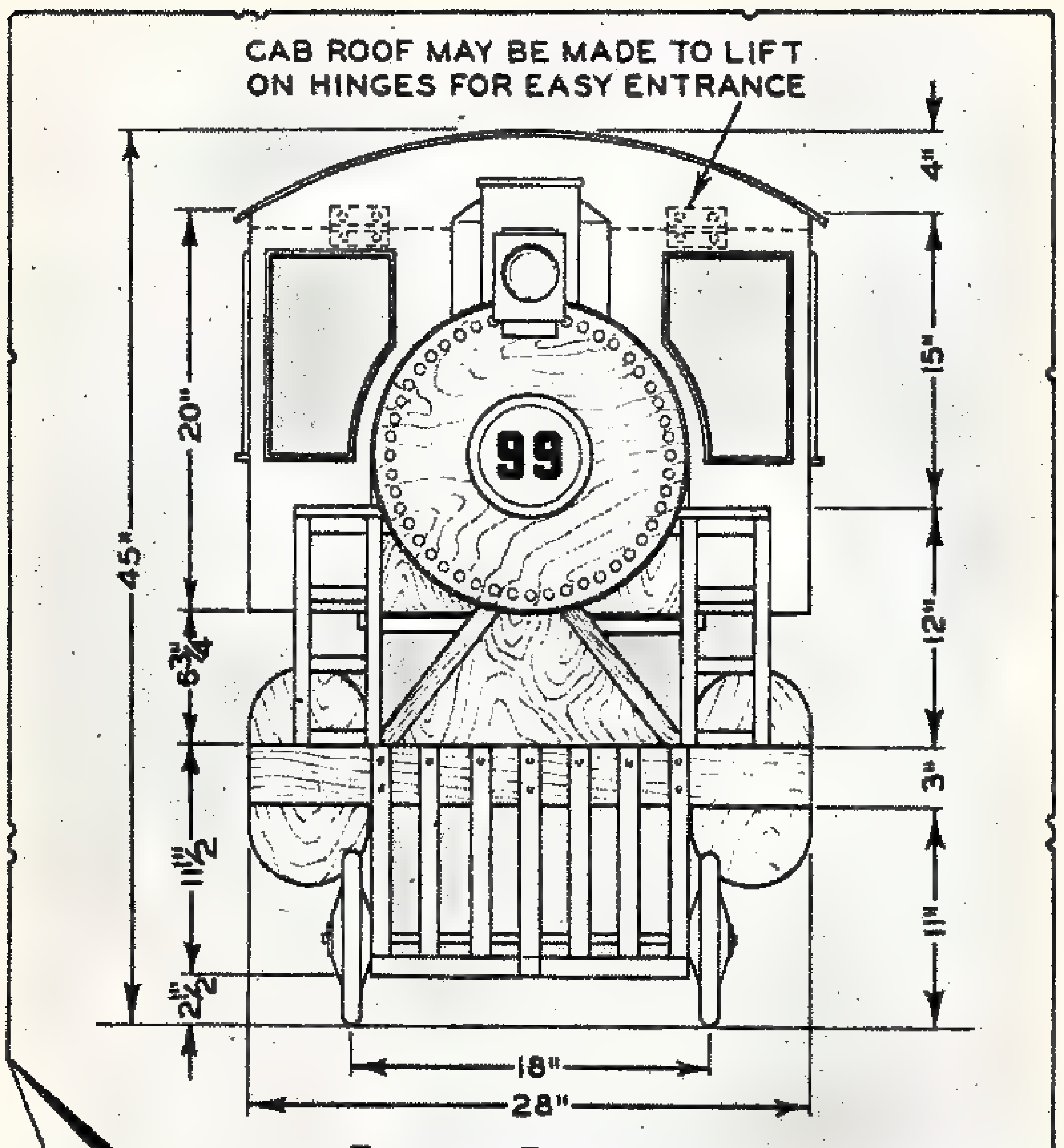
Attached to a large box kite your inexpensive camera can be used to take interesting aerial photos. Slow burning punk is used to release camera shutter in manner shown in diagram.

A Midget Foot-Powered Locomotive

by **MANLEY MILLS**

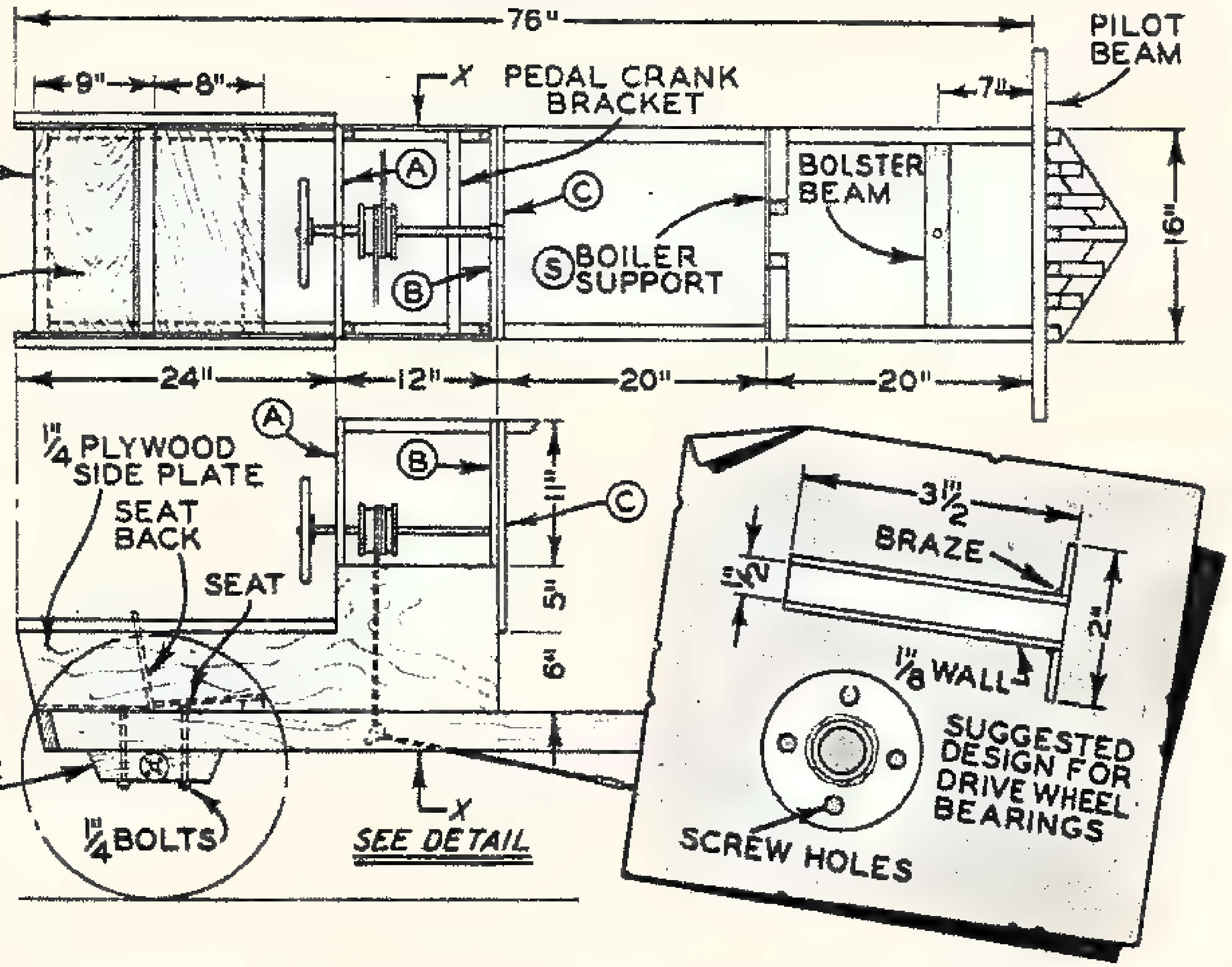
BUILT mostly from discarded materials that can be readily picked up about the workshop this novel foot-powered midget locomotive will make any youth the envy of his friends. Unlike the usual foot propelled locomotive, this one permits the engineer to ride in the cab instead of in the tender.

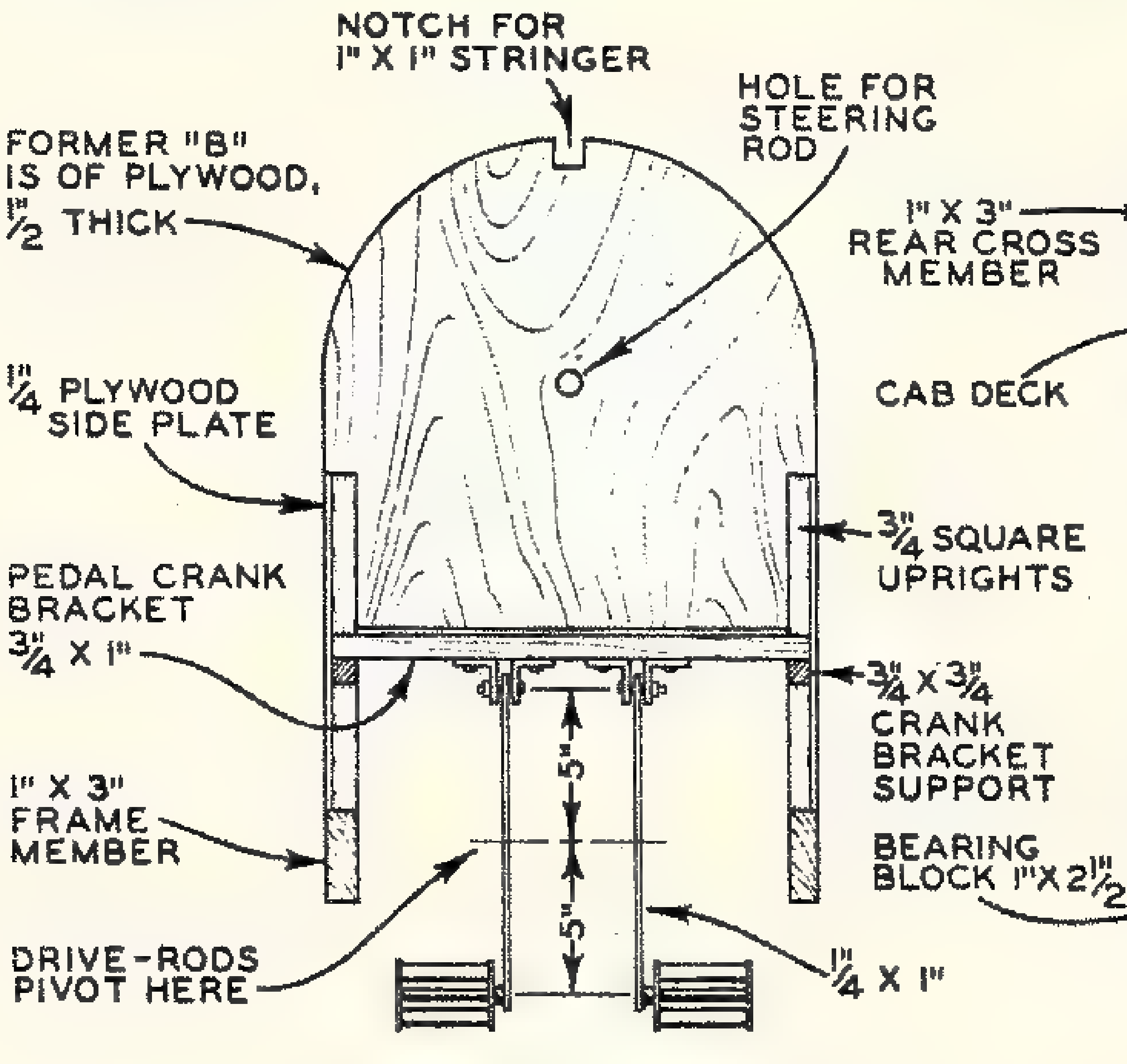
While it isn't necessary that the dimensions given here be followed out to the Nth degree, they should be followed as closely as possible in order that the locomotive will operate properly. In constructing the engine and tender start with the frame for the boiler. This is made from lengths of 3″x1″ stock as is the rear cross-member and pilot beam. The pilot trucks are made from the front end of a coaster wagon chassis equipped with 9″


CAB ROOF MAY BE MADE TO LIFT ON HINGES FOR EASY ENTRANCE
4"
15"
12"
3"
11"
45"
20"
6¾"
11½"
2½"
99
18"
28"

FRONT • ELEVATION

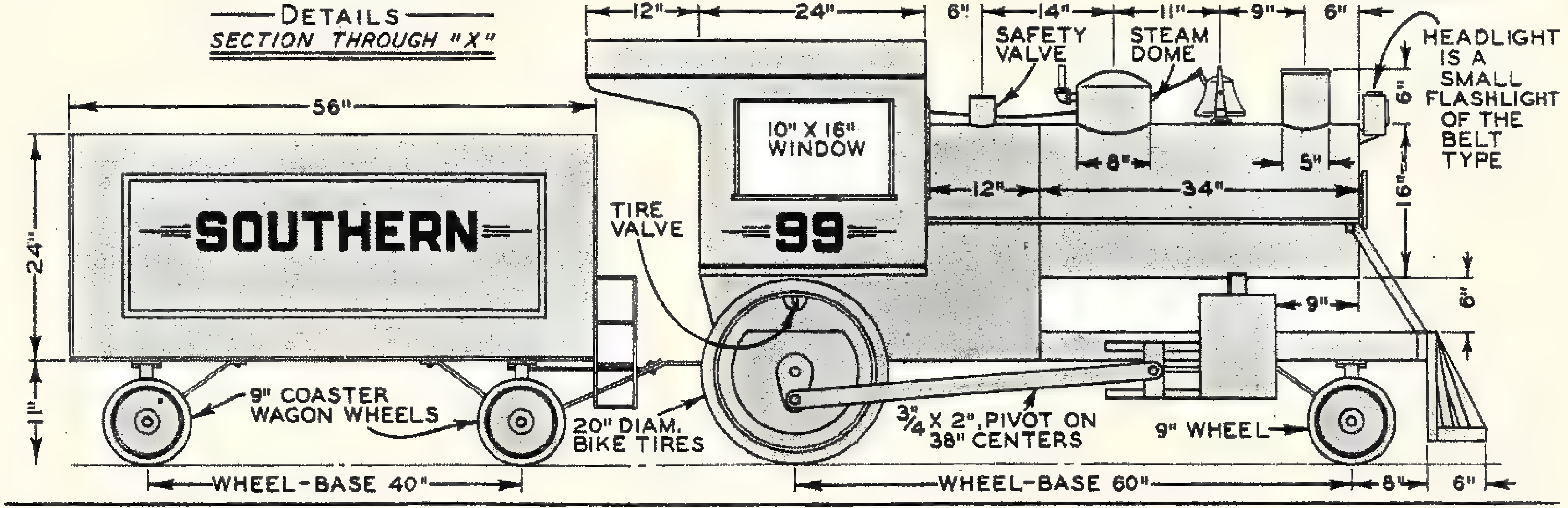
THE CHASSIS DETAILS


76"
9"
8"
X
PEDAL CRANK BRACKET
7"
PILOT BEAM
1" X 3" REAR CROSS MEMBER
A
C
B
S BOILER SUPPORT
BOLSTER BEAM
16"
CAB DECK
24"
12"
20"
20"
¼ PLYWOOD SIDE PLATE
SEAT BACK
SEAT
11"
5"
6"
¼ BOLTS
X
SEE DETAIL
3½
½
BRAZE
2"
⅛ WALL
SUGGESTED DESIGN FOR DRIVE WHEEL BEARINGS
SCREW HOLES


NOTCH FOR 1" X 1" STRINGER
HOLE FOR STEERING ROD
FORMER "B" IS OF PLYWOOD, ½ THICK
¼ PLYWOOD SIDE PLATE
PEDAL CRANK BRACKET ¾ X 1"
1" X 3" FRAME MEMBER
DRIVE-RODS PIVOT HERE
¾ SQUARE UPRIGHTS
¾ X ¾ CRANK BRACKET SUPPORT
BEARING BLOCK 1"X2½
¼ X 1"
5"
5"

PEDAL & MOUNTING DETAILS

SECTION THROUGH "X"


12"
24"
6"
14"
11"
9"
6"
SAFETY VALVE
STEAM DOME
HEADLIGHT IS A SMALL FLASHLIGHT OF THE BELT TYPE
6"
56"
10" X 16" WINDOW
8"
5"
12"
34"
16"
SOUTHERN
99
24"
TIRE VALVE
9"
6"
11"
9" COASTER WAGON WHEELS
20" DIAM. BIKE TIRES
¾ X 2", PIVOT ON 38" CENTERS
9" WHEEL
WHEEL-BASE 40"
WHEEL-BASE 60"
8"
6"

The above pictorial diagrams show the simplicity of the toy locomotive. While it is not necessary to follow the exact dimensions given here adhere to them as closely as possible. Parts from broken toy autos and wagons will aid in construction.

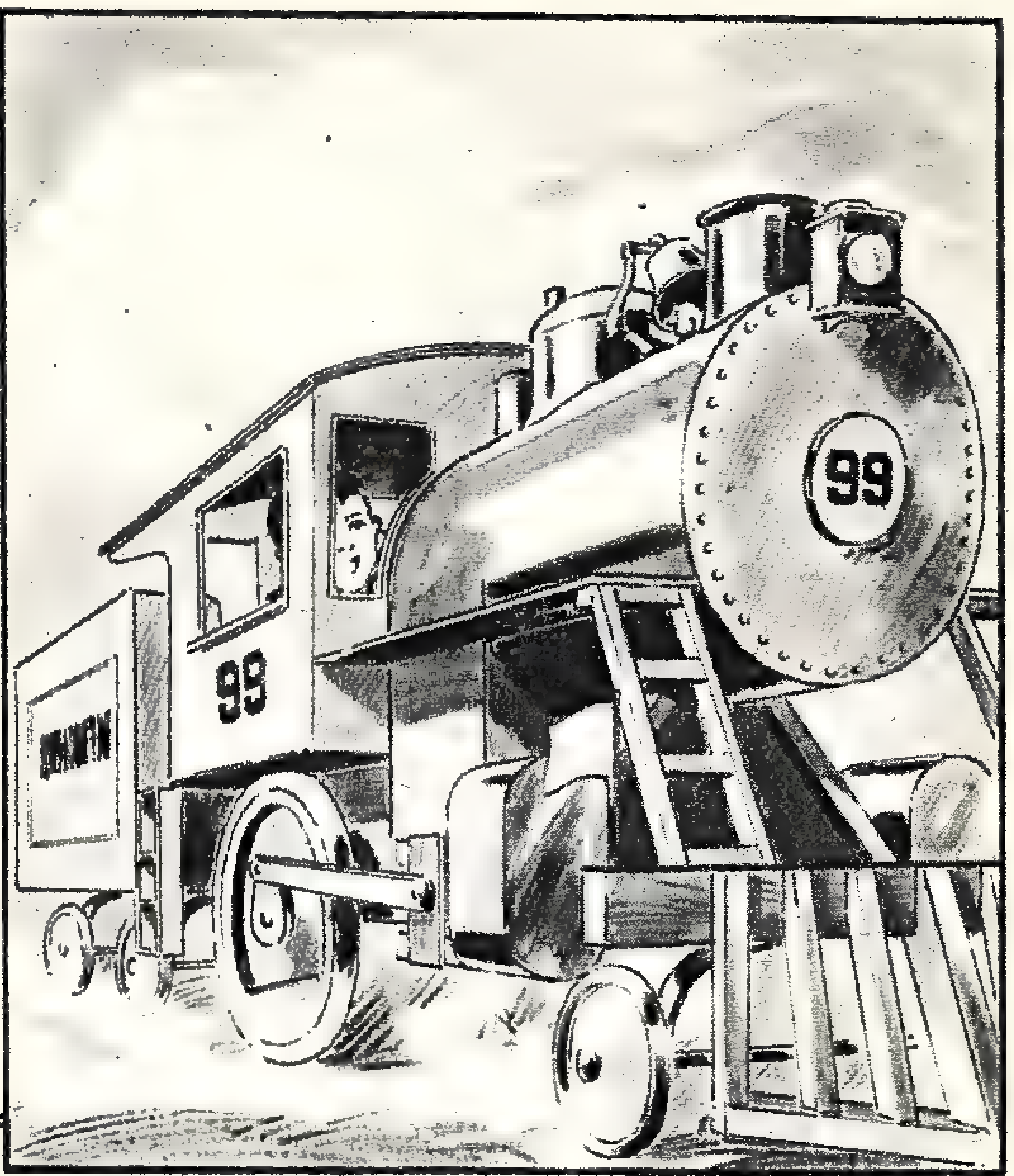
That Any Boy Can Build

wheels. The pilot guard is fashioned from either wood strips or strap iron, the latter being suggested.

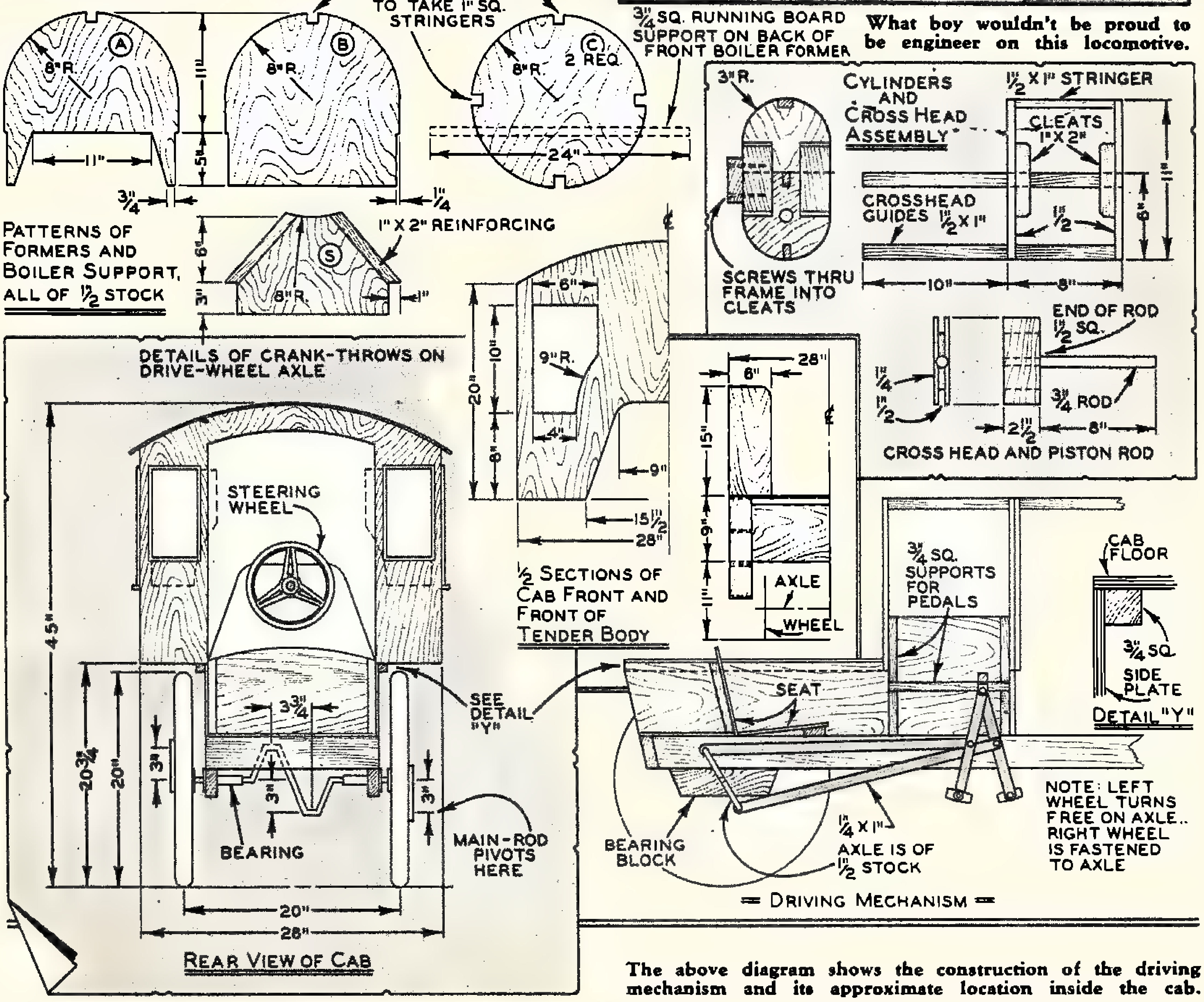
The boiler is of the thinnest gauge sheet metal obtainable and attached to a suitable wooden frame with small wood screws. The cab is made of plywood except for the roof which is of the same metal as the boiler. Sheet metal attached to a wooden supporting frame forms realistic cylinders for the driving rod mechanism. The drive rods being nothing more than lengths of stock measuring ¾x2x38″ are extremely simple to make.

A pair of 20″ bicycle rims are screwed in place over a disc having a diameter equal to the inside diameter of the rims. A notch is cut in the discs to allow for inflating the tires. The drive shafts are attached to the wheels

[*Continued on page* 120]



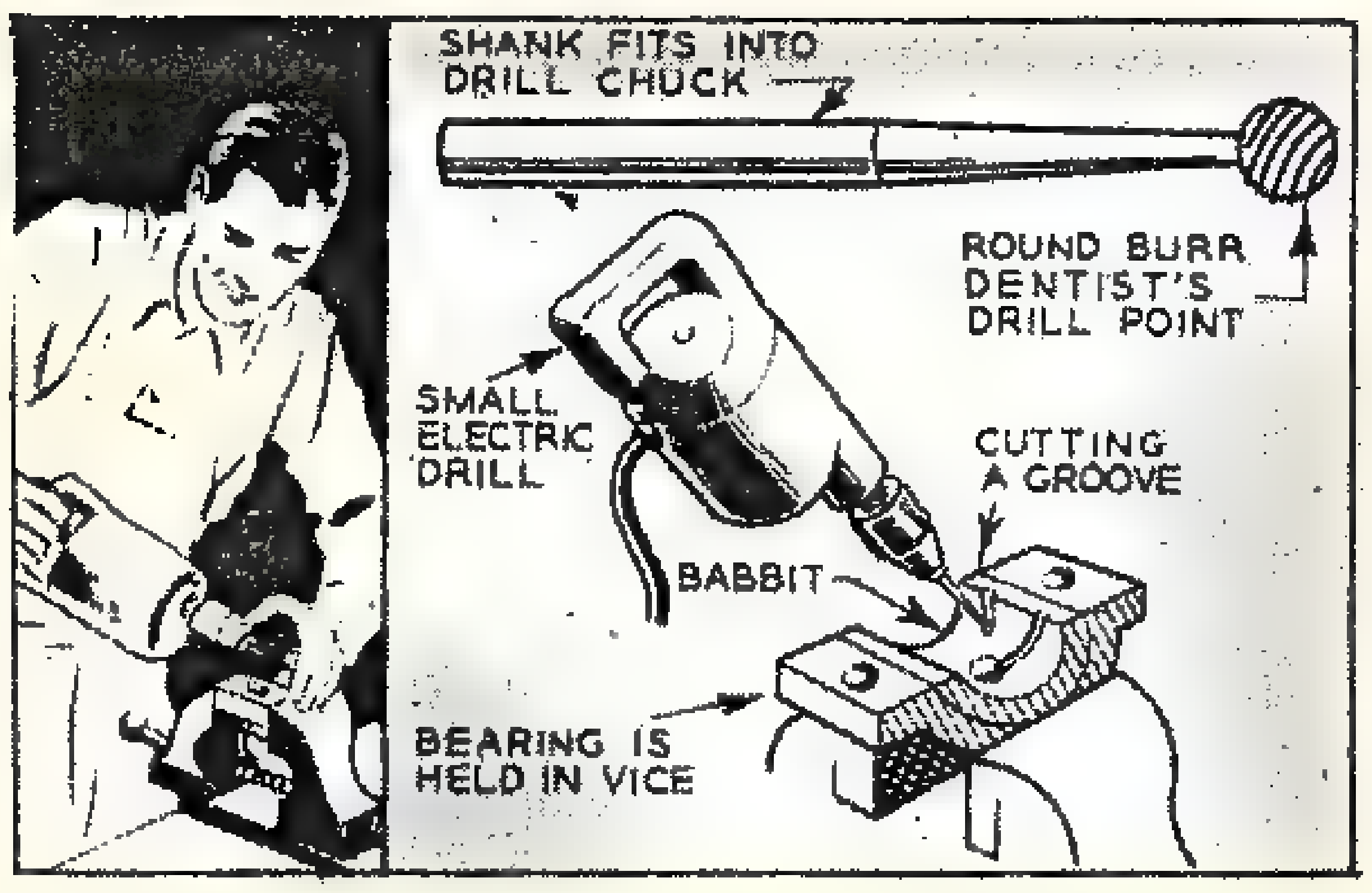
What boy wouldn't be proud to be engineer on this locomotive.


THESE NOTCHES TO TAKE 1" SQ. STRINGERS
A
B
C 2 REQ.
8"R.
11"
5½"
11"
¾"
¼"
24"
¾" SQ. RUNNING BOARD SUPPORT ON BACK OF FRONT BOILER FORMER
PATTERNS OF FORMERS AND BOILER SUPPORT, ALL OF ½ STOCK
1" X 2" REINFORCING
S
8"R.
6"
3"
1"
DETAILS OF CRANK-THROWS ON DRIVE-WHEEL AXLE
CYLINDERS AND CROSS HEAD ASSEMBLY
3"R.
½" X 1" STRINGER
CLEATS 1" X 2"
CROSSHEAD GUIDES ½" X 1"
SCREWS THRU FRAME INTO CLEATS
10"
8"
6"
11"
END OF ROD 1½" SQ.
¾ ROD
2½"
CROSS HEAD AND PISTON ROD
6"
10"
9"R.
20"
8"
4"
9"
15½"
28"
½ SECTIONS OF CAB FRONT AND FRONT OF TENDER BODY
28"
15"
9"
11"
AXLE
WHEEL
STEERING WHEEL
45"
20¾"
20"
3¾"
3"
BEARING
SEE DETAIL "Y"
MAIN-ROD PIVOTS HERE
20"
28"
REAR VIEW OF CAB
¾ SQ. SUPPORTS FOR PEDALS
SEAT
BEARING BLOCK
¼ X 1" AXLE IS OF 1½ STOCK
NOTE: LEFT WHEEL TURNS FREE ON AXLE.. RIGHT WHEEL IS FASTENED TO AXLE
DRIVING MECHANISM
CAB FLOOR
¾ SQ. SIDE PLATE
DETAIL "Y"

The above diagram shows the construction of the driving mechanism and its approximate location inside the cab.

NEW STUNTS For The AUTO MECHANIC

Dentists Drill Cuts Oil Groove In Bearings


SHANK FITS INTO DRILL CHUCK
ROUND BURR DENTIST'S DRILL POINT
SMALL ELECTRIC DRILL
CUTTING A GROOVE
BABBIT
BEARING IS HELD IN VICE

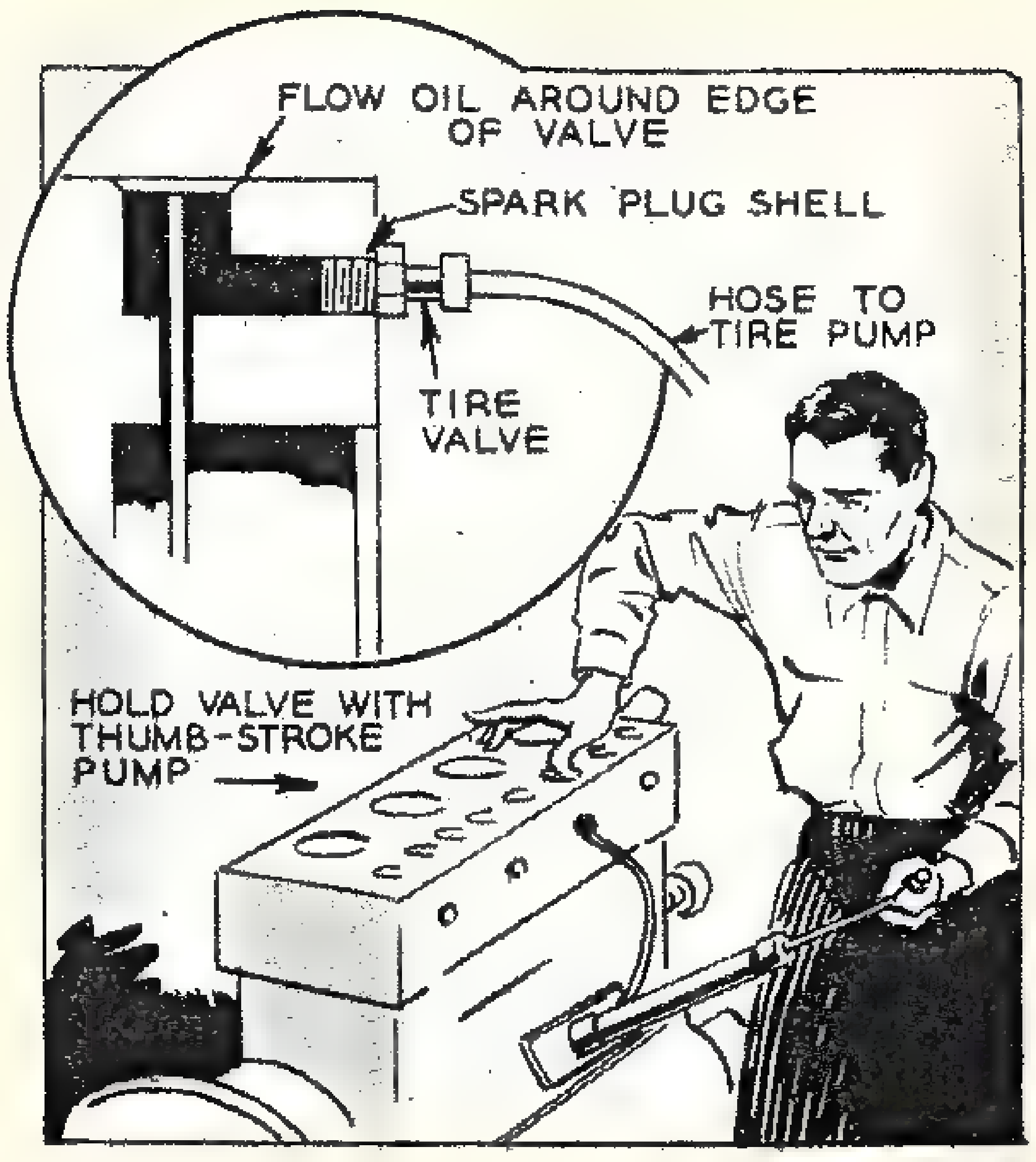
THE usual difficulty experienced in cutting oil grooves in babbit bearings is eliminated by the use of discarded dentists' drill points in a small hand electric drill. Neat, clean grooves of any desired depth and width may be easily cut by this method. Since drills of this type cannot be resharpened your dentist will gladly provide them to you gratis.—Arthur C. Klust, Minneapolis, Minn.

Auto Pump Locates Leaky Valves

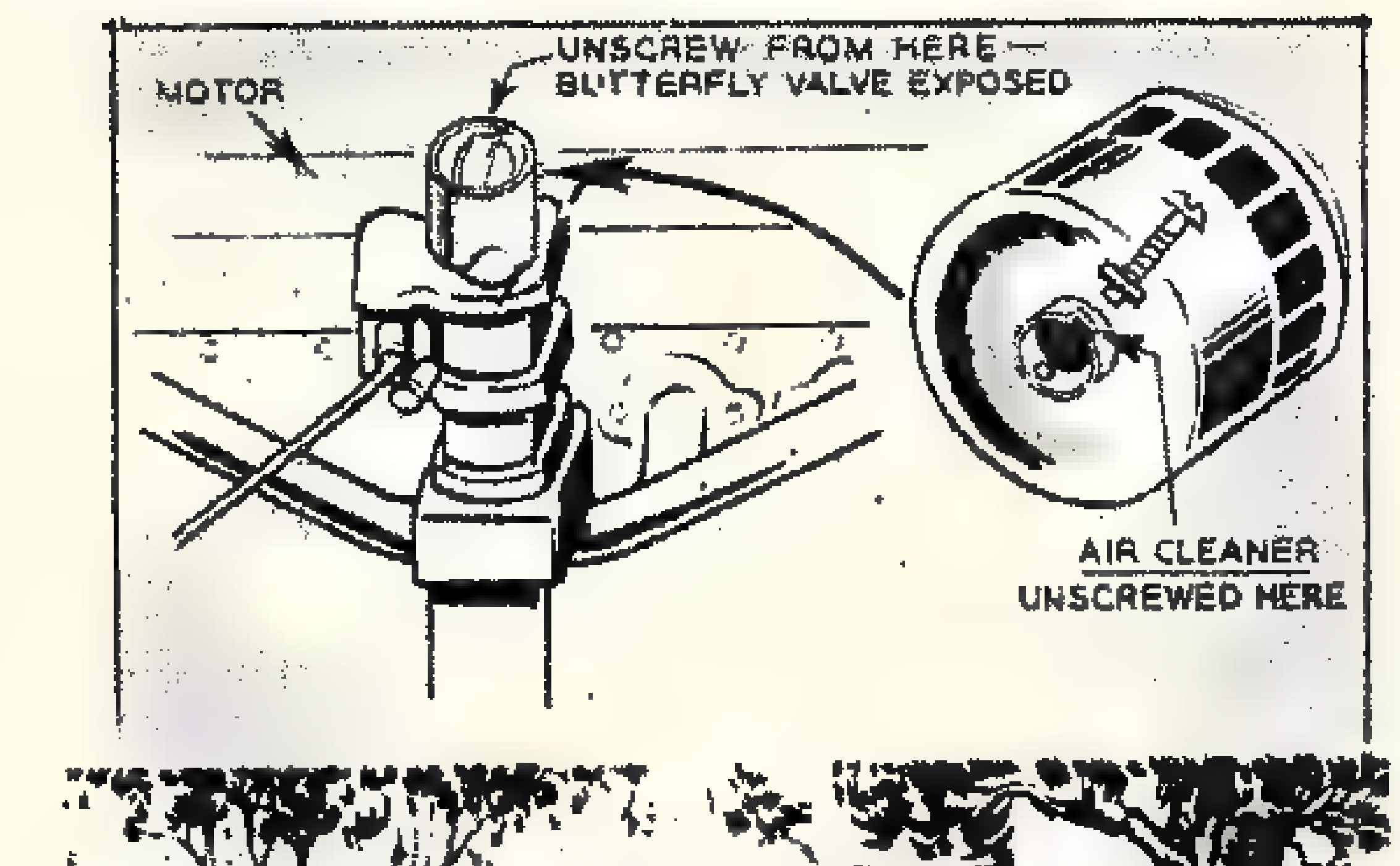
AN AUTO pump is a valuable aid in locating leaky valves in your car's motor. Break away the porcelain from an old spark plug and solder an inner tube stem in the spark plug shell.

To test for a leaking valve flow a small amount of lubricating oil around the valve so a perfect seal is made, Next attach the auto pump to the valve stem which has been inserted in the respective spark plug tap. With one hand hold the valve down and at the same time force the pump handle down. If the valve leaks, air bubbles will form in the oil film, indicating that a leak is present.

Leaking valves thus located may be ground down and the process repeated until there is no leakage present. All valves may be checked in this manner.—Clayton Farley, Columbus, Ohio.


FLOW OIL AROUND EDGE OF VALVE
SPARK PLUG SHELL
HOSE TO TIRE PUMP
TIRE VALVE
HOLD VALVE WITH THUMB-STROKE PUMP

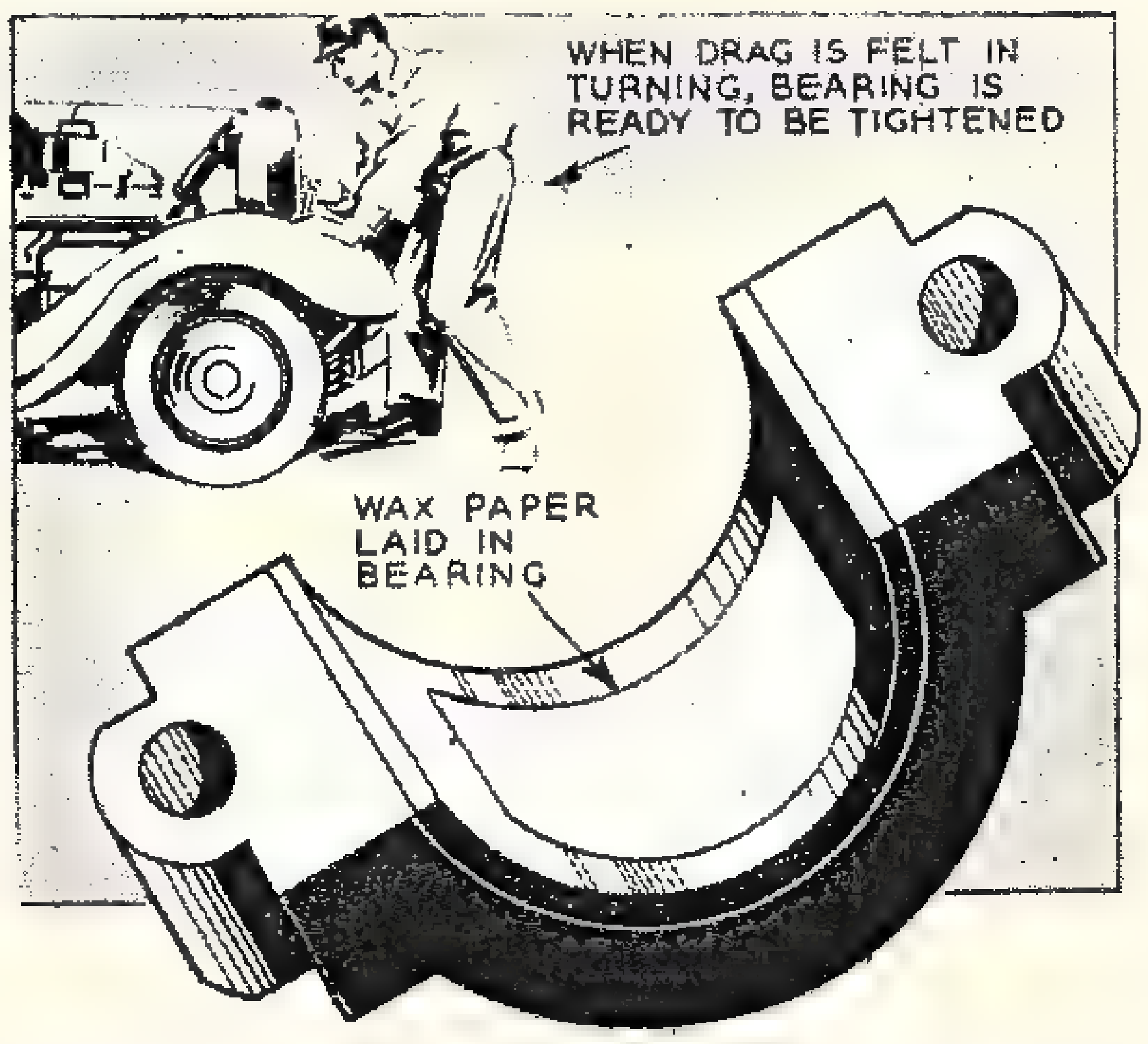
Starting Motor After Running Out Of Gas


MOTOR
UNSCREW FROM HERE— BUTTERFLY VALVE EXPOSED
AIR CLEANER UNSCREWED HERE

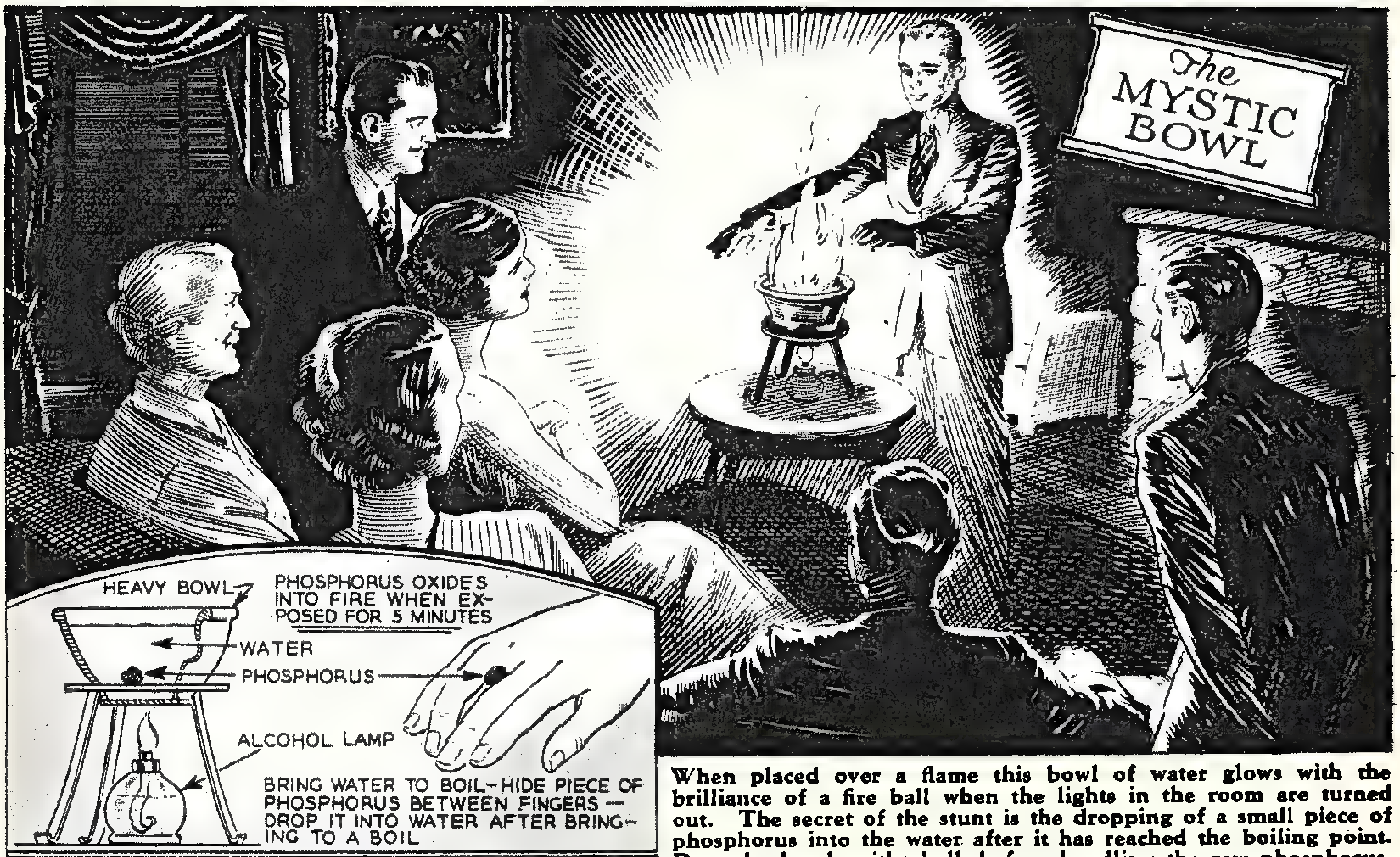
ON MODERN automobiles the well-known vacuum tank is no longer used and starting up the car after running out of gas is quite a problem unless you know the method of procedure. The air filter on the carburetor is removed and a few drops of gasoline injected directly into the carburetor. Stepping on the starter will immediately set the motor into operation. The filter being held in place with a single machine screw is easily replaced after injecting the gas. It is better, of course, to watch your gauge and not run out of gas.—Vernon Tracey, Centerville, N. B.

Wax Paper Makes Ideal Bearing Adjustment

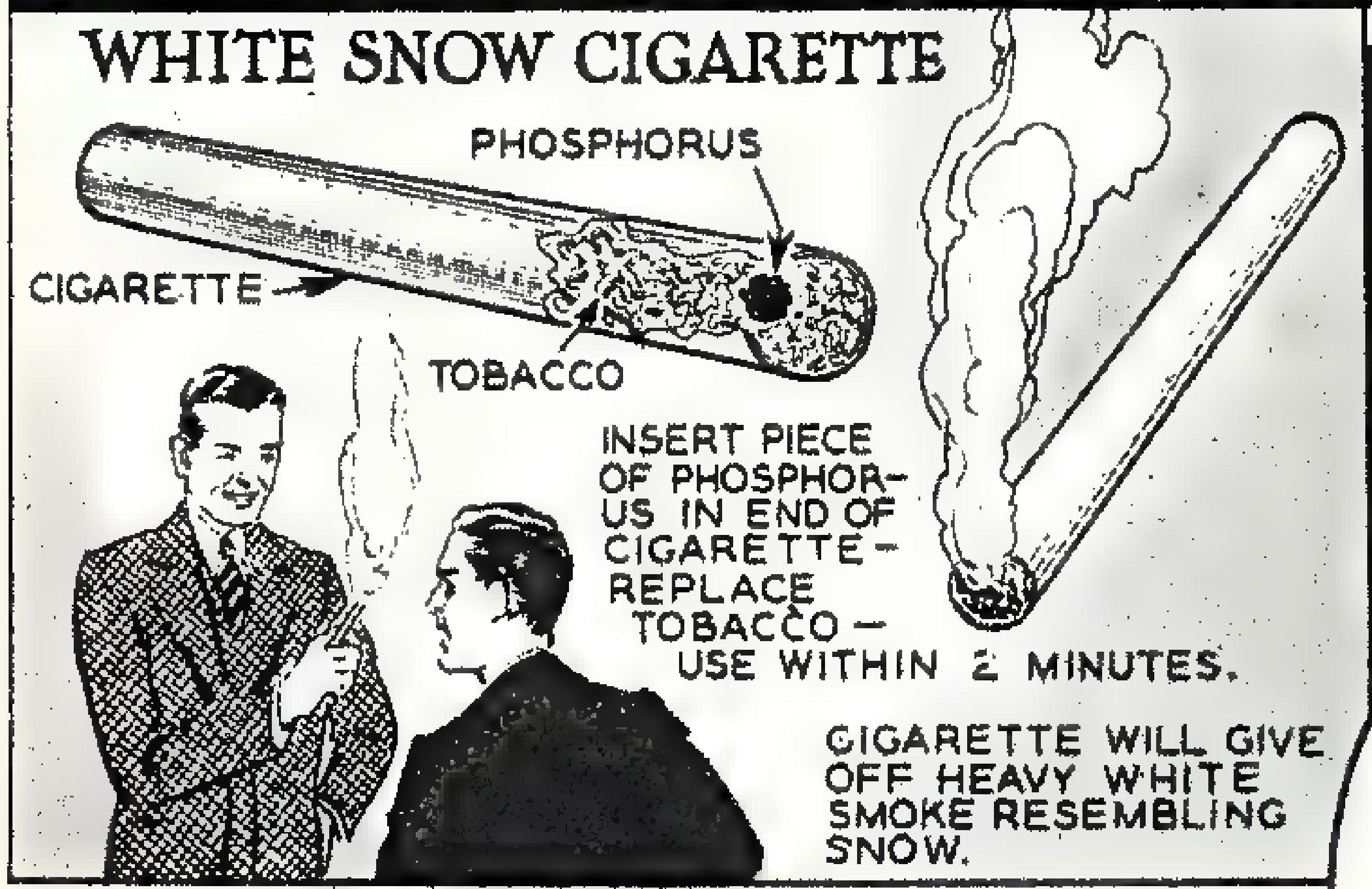
A TIME saving and accurate bearing adjustment can be accomplished by using a piece of wax paper. Cut the paper slightly smaller than the bearing surface then insert between the crankshaft and bearing surface. If no tight drag is felt when the crankshaft is turned, file down the bearing surface until the shaft turns, but is sufficiently tight to require effort in turning. When the shaft can be turned it is an indication that there is sufficient clearance for the oil pressure system to function.—A. O. Detjon, Maywood, Illinois.


WHEN DRAG IS FELT IN TURNING, BEARING IS READY TO BE TIGHTENED
WAX PAPER LAID IN BEARING

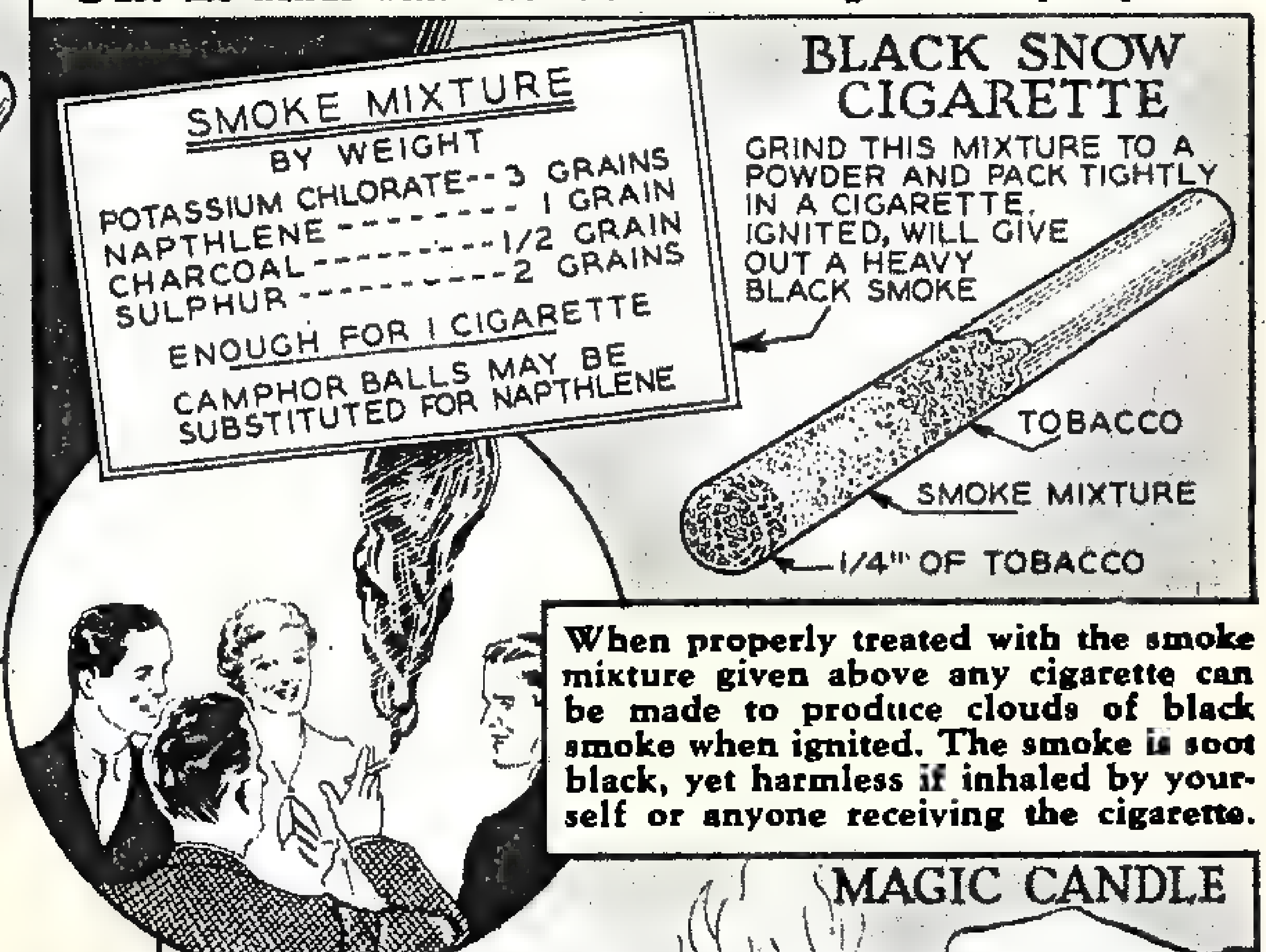
Mystifying With Chemical Magic


The MYSTIC BOWL
HEAVY BOWL
PHOSPHORUS OXIDES INTO FIRE WHEN EXPOSED FOR 5 MINUTES
WATER
PHOSPHORUS
ALCOHOL LAMP
BRING WATER TO BOIL–HIDE PIECE OF PHOSPHORUS BETWEEN FINGERS — DROP IT INTO WATER AFTER BRINGING TO A BOIL

When placed over a flame this bowl of water glows with the brilliance of a fire ball when the lights in the room are turned out. The secret of the stunt is the dropping of a small piece of phosphorus into the water after it has reached the boiling point. Dust the hands with chalk before handling the raw phosphorus.


WHITE SNOW CIGARETTE
PHOSPHORUS
CIGARETTE
TOBACCO
INSERT PIECE OF PHOSPHORUS IN END OF CIGARETTE–REPLACE TOBACCO — USE WITHIN 2 MINUTES.
CIGARETTE WILL GIVE OFF HEAVY WHITE SMOKE RESEMBLING SNOW.

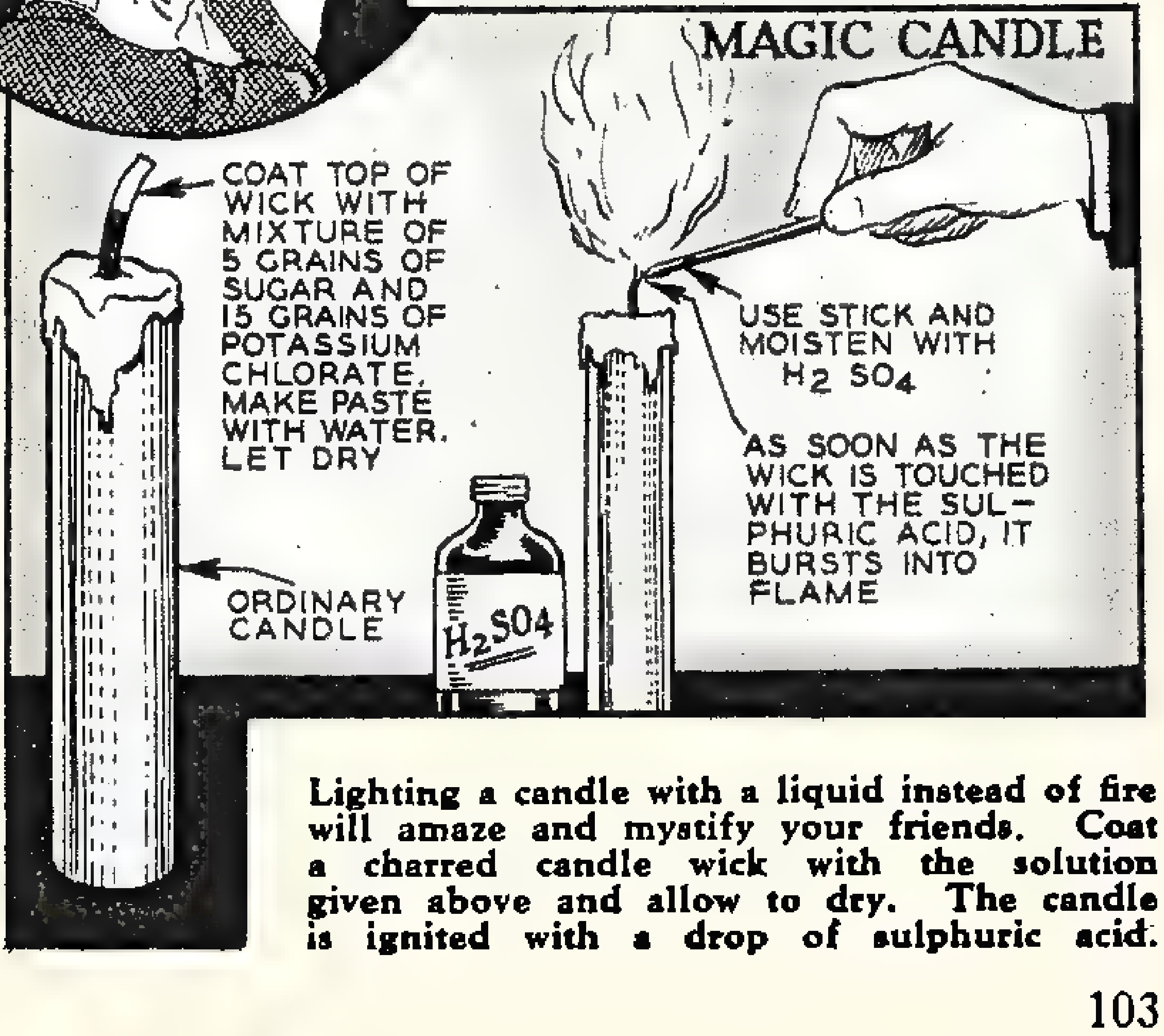
Upon lighting this cigarette volumes of white smoke issue from it to the amazement of the onlookers. Prepare the cigarette by removing some of the tobacco from the tip and inserting a piece of phosphorus the size of a rice grain, then replace the tobacco in the tip.


BLACK SNOW CIGARETTE
GRIND THIS MIXTURE TO A POWDER AND PACK TIGHTLY IN A CIGARETTE. IGNITED, WILL GIVE OUT A HEAVY BLACK SMOKE
TOBACCO
SMOKE MIXTURE
1/4" OF TOBACCO

SMOKE MIXTURE
BY WEIGHT
POTASSIUM CHLORATE-- 3 GRAINS
NAPTHLENE --------- 1 GRAIN
CHARCOAL--------- 1/2 GRAIN
SULPHUR ----------- 2 GRAINS
ENOUGH FOR 1 CIGARETTE
CAMPHOR BALLS MAY BE SUBSTITUTED FOR NAPTHLENE

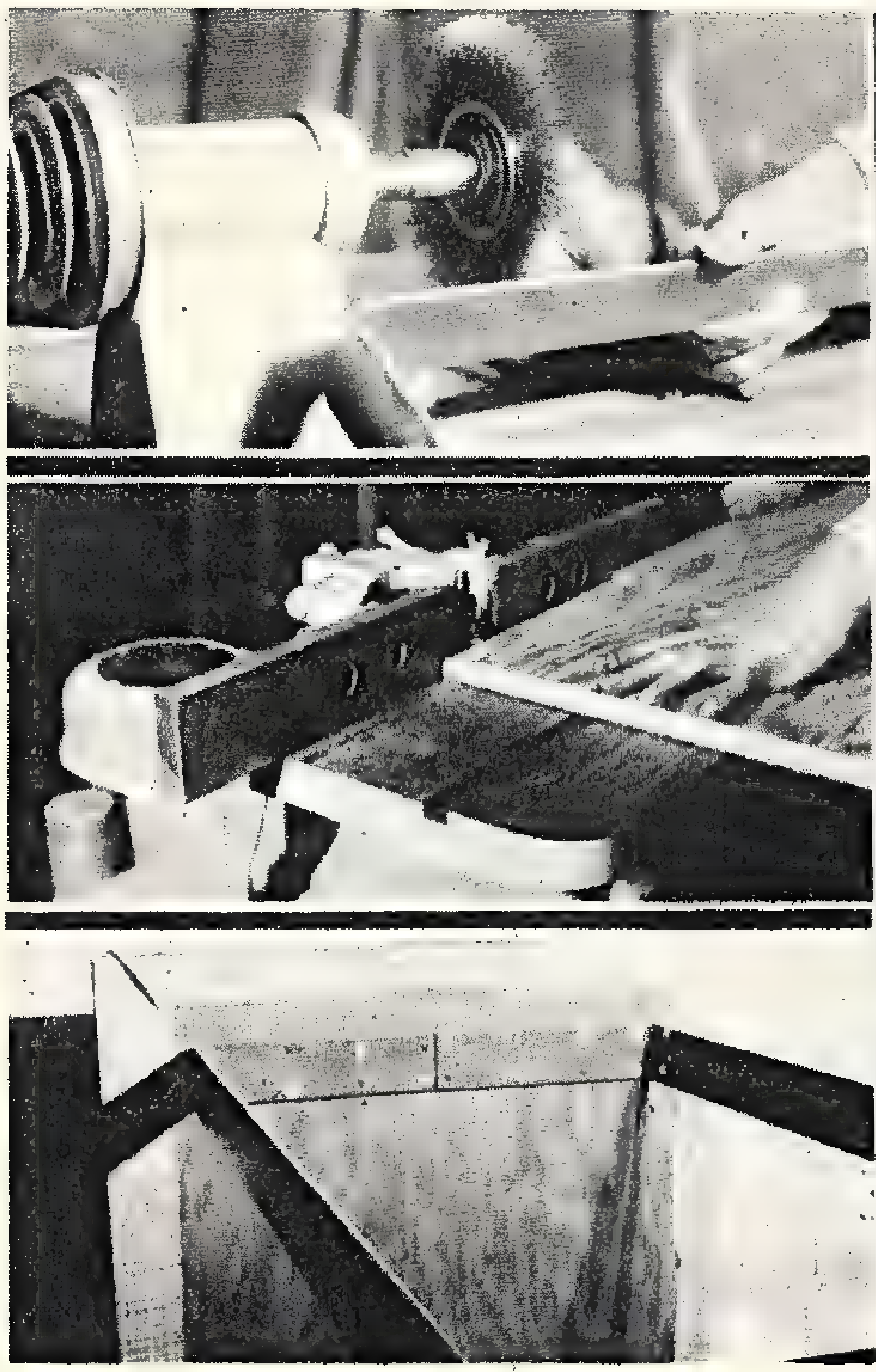
When properly treated with the smoke mixture given above any cigarette can be made to produce clouds of black smoke when ignited. The smoke is soot black, yet harmless if inhaled by yourself or anyone receiving the cigarette.

WHILE all stunts described above are harmless, care should be exercised in the handling of the phosphorous and sulphuric acid (H_2SO_4). Prosphorous when exposed to open air for periods longer than two minutes will burst into flame, therefore submerge it in kerosene when not in use. To protect your fingers from its effects powder them with chalk or talcum. A pair of small forceps may be also used, if available, in handling small pieces of the chemical. In handling the sulphuric acid be sure that none drops on clothing as it rots material.

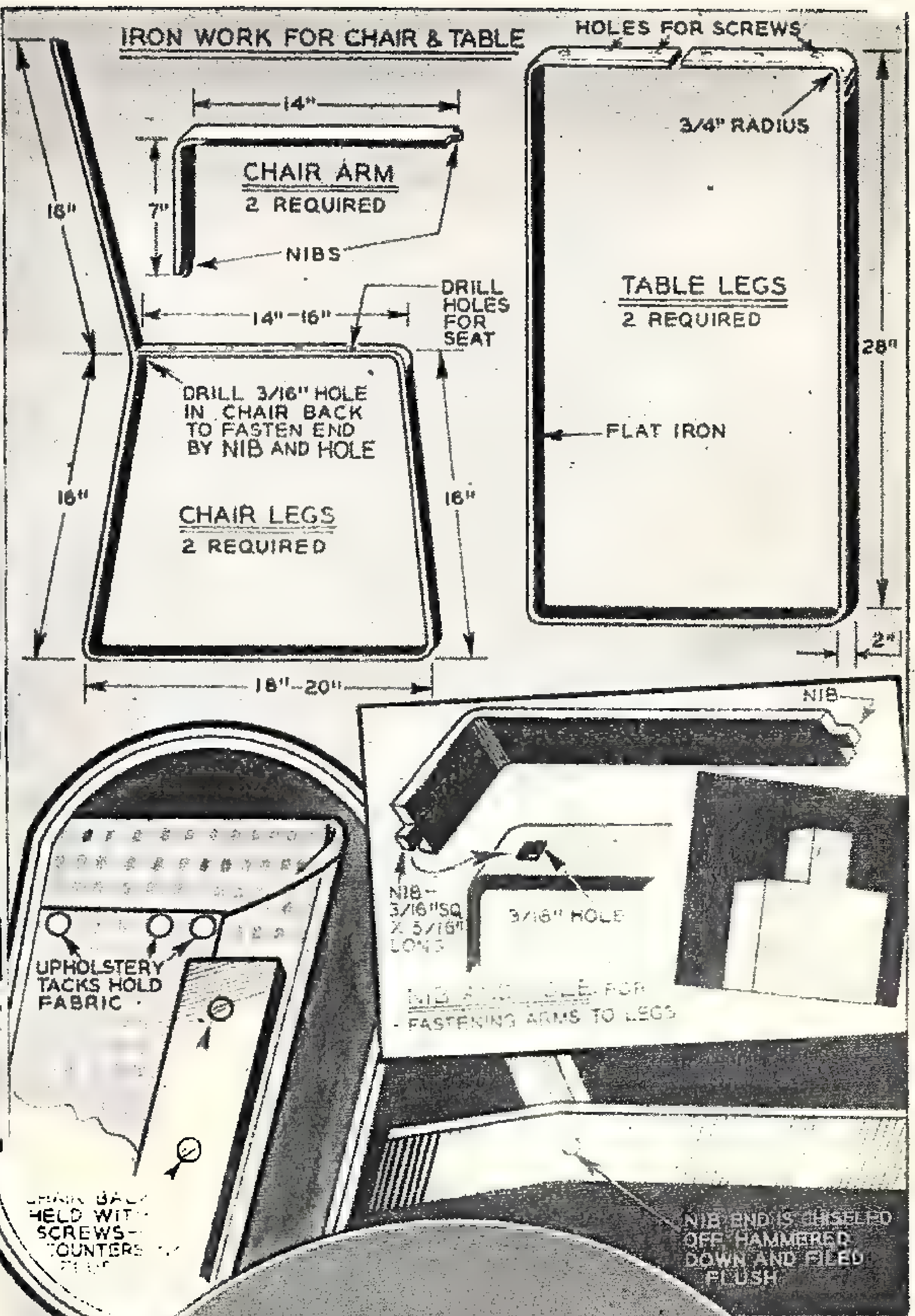

MAGIC CANDLE
COAT TOP OF WICK WITH MIXTURE OF 5 GRAINS OF SUGAR AND 15 GRAINS OF POTASSIUM CHLORATE. MAKE PASTE WITH WATER. LET DRY
ORDINARY CANDLE
H2SO4
USE STICK AND MOISTEN WITH H2 SO4
AS SOON AS THE WICK IS TOUCHED WITH THE SULPHURIC ACID, IT BURSTS INTO FLAME

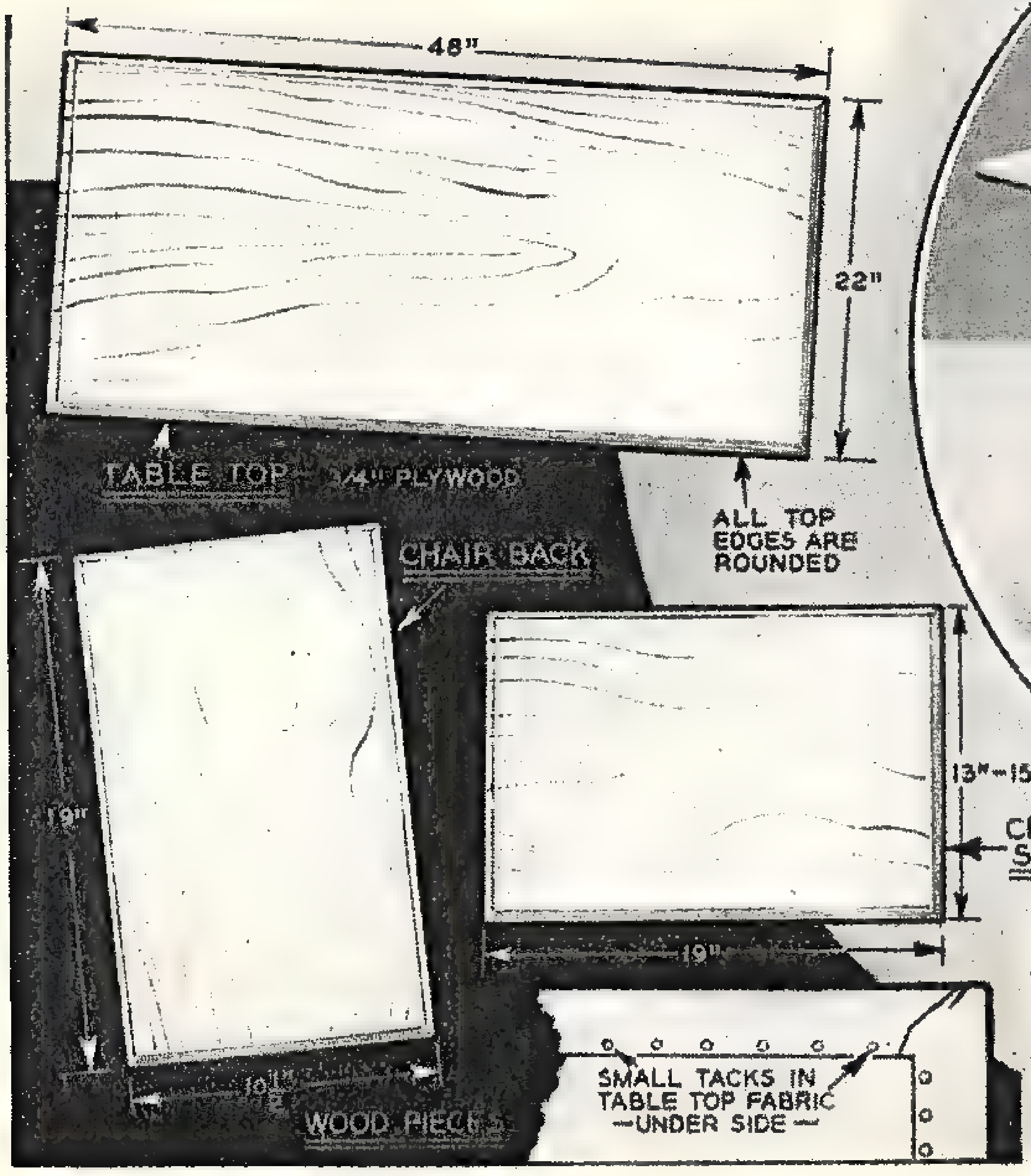
Lighting a candle with a liquid instead of fire will amaze and mystify your friends. Coat a charred candle wick with the solution given above and allow to dry. The candle is ignited with a drop of sulphuric acid.

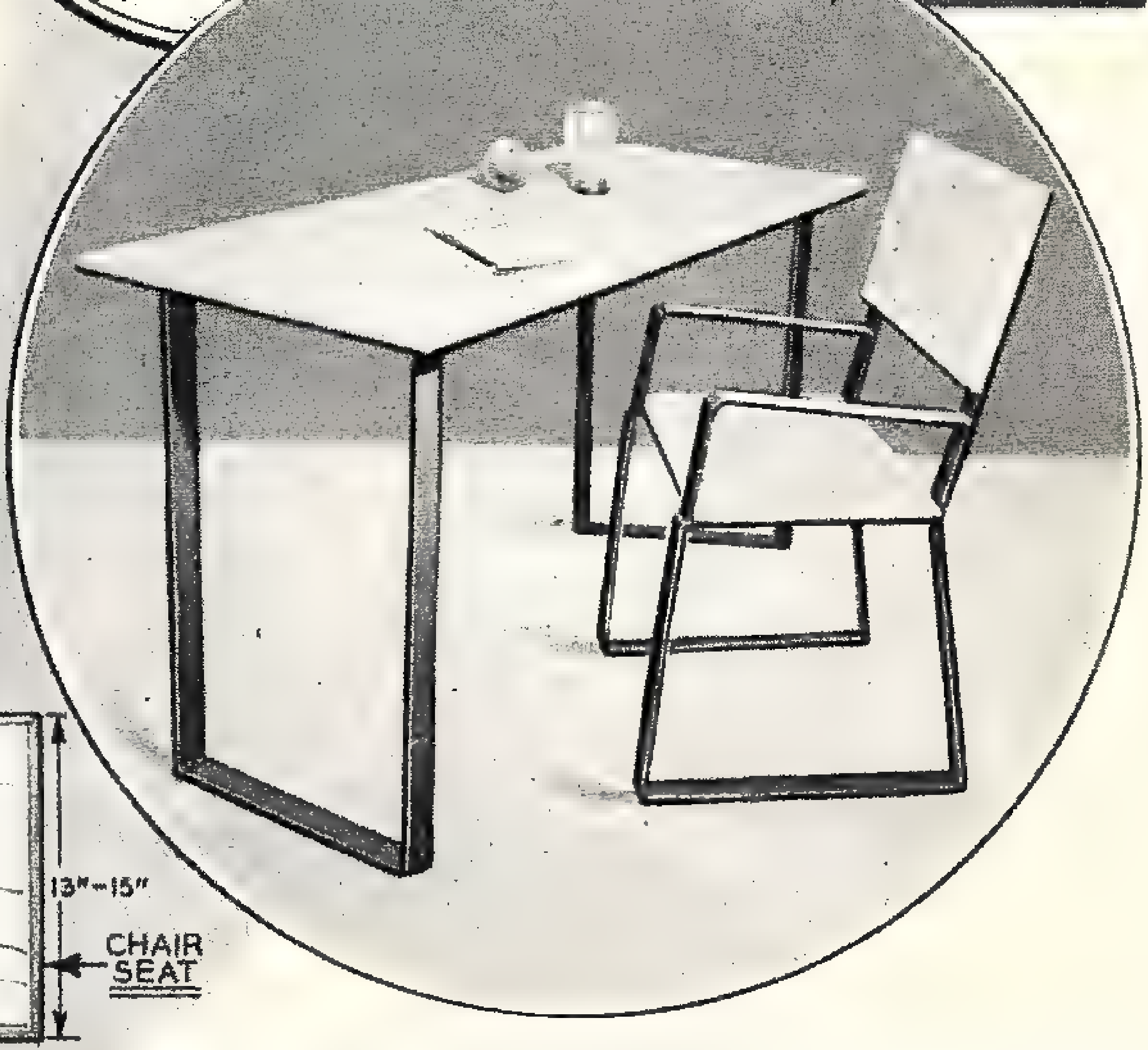
Practical MODERN FURNITURE



Modern furniture is easy to make. The upper photo shows how a scratch wheel may be used to give the metal a bright finish after which it is lacquered. Center photo is shown the table top being squared up on the shaper with the leg installation clearly defined in the lower picture.

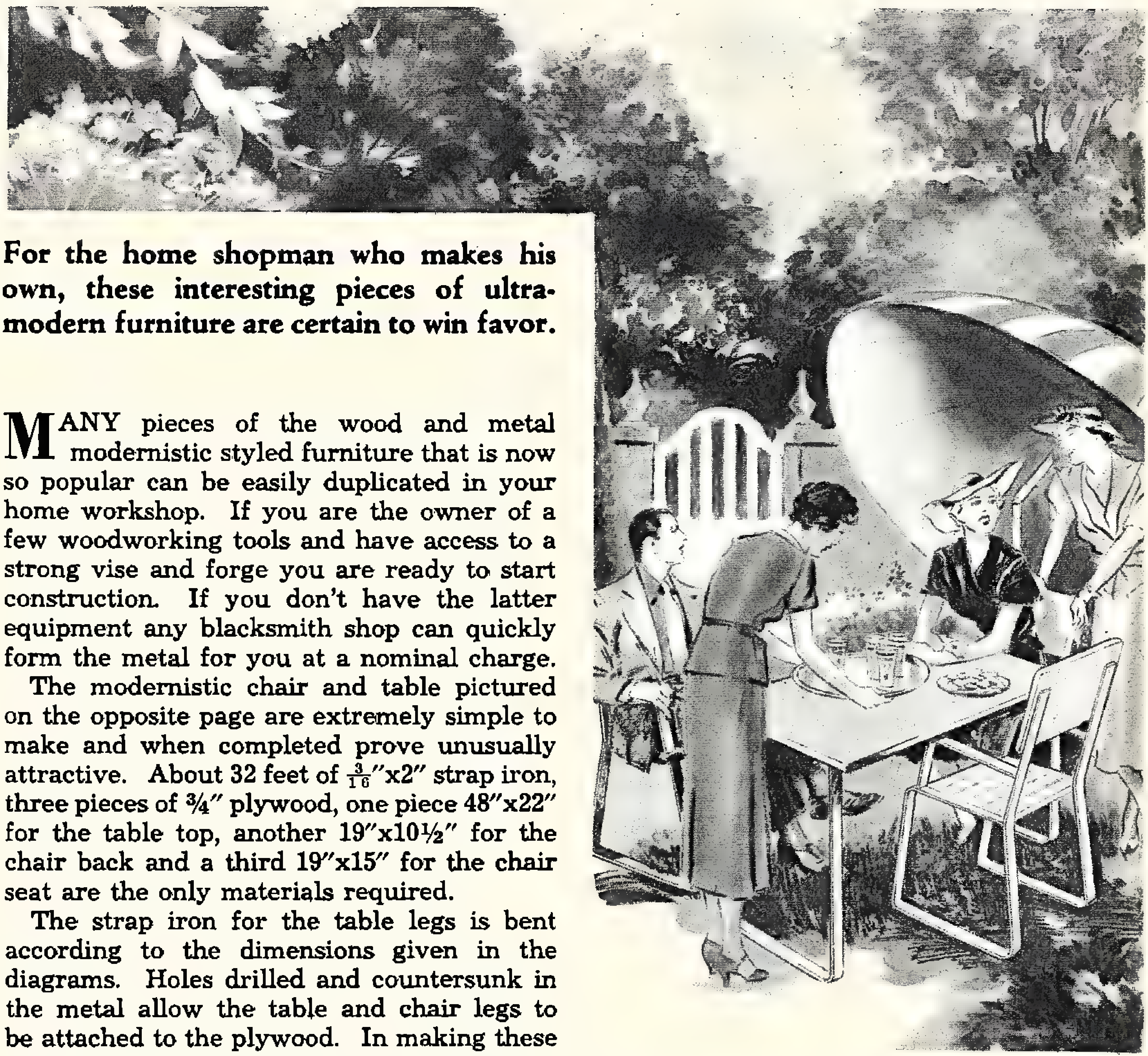

IRON WORK FOR CHAIR & TABLE
HOLES FOR SCREWS
3/4" RADIUS
14"
7"
CHAIR ARM
2 REQUIRED
NIBS
16"
14"-16"
DRILL HOLES FOR SEAT
DRILL 3/16" HOLE IN CHAIR BACK TO FASTEN END BY NIB AND HOLE
16"
16"
CHAIR LEGS
2 REQUIRED
18"-20"
TABLE LEGS
2 REQUIRED
FLAT IRON
28"
2"
NIB
NIB - 3/16" SQ. X 5/16" LONG
3/16" HOLE
FASTENING ARMS TO LEGS
UPHOLSTERY TACKS HOLD FABRIC
HELD WITH SCREWS
NIB END IS CHISELED OFF, HAMMERED DOWN AND FILED FLUSH


48"
22"
TABLE TOP 3/4" PLYWOOD
ALL TOP EDGES ARE ROUNDED
CHAIR BACK
19"
10"
WOOD PIECES
13"-15"
CHAIR SEAT
19"
SMALL TACKS IN TABLE TOP FABRIC —UNDER SIDE—



Not only is this modern table and chair durable, but very attractive as well. Constructed of strap iron and plywood the furniture can be worked into the color scheme of any home. Forming of the metal parts can be done at home by following the diagrams given here. The height may be altered to meet the particular needs although care should be taken to keep one leg or chair arm from being higher than the other. The furniture is covered with plaid fabric.

FOR THE WORKSHOP FAN



For the home shopman who makes his own, these interesting pieces of ultra-modern furniture are certain to win favor.

MANY pieces of the wood and metal modernistic styled furniture that is now so popular can be easily duplicated in your home workshop. If you are the owner of a few woodworking tools and have access to a strong vise and forge you are ready to start construction. If you don't have the latter equipment any blacksmith shop can quickly form the metal for you at a nominal charge.

The modernistic chair and table pictured on the opposite page are extremely simple to make and when completed prove unusually attractive. About 32 feet of $\frac{3}{16}$"x2" strap iron, three pieces of ¾" plywood, one piece 48"x22" for the table top, another 19"x10½" for the chair back and a third 19"x15" for the chair seat are the only materials required.

The strap iron for the table legs is bent according to the dimensions given in the diagrams. Holes drilled and countersunk in the metal allow the table and chair legs to be attached to the plywood. In making these metal pieces make certain that they match so that the furniture sets level. The height of the table may be increased to meet your particular needs if desired.

The chair may be constructed with or without arms. If arms are desired cut nibs in the strap iron so that the formed metal can be rigidly mounted to the chair legs. To do this drill holes in the leg and back supports, insert the arm nibs then hammer them flat as you would rivets.

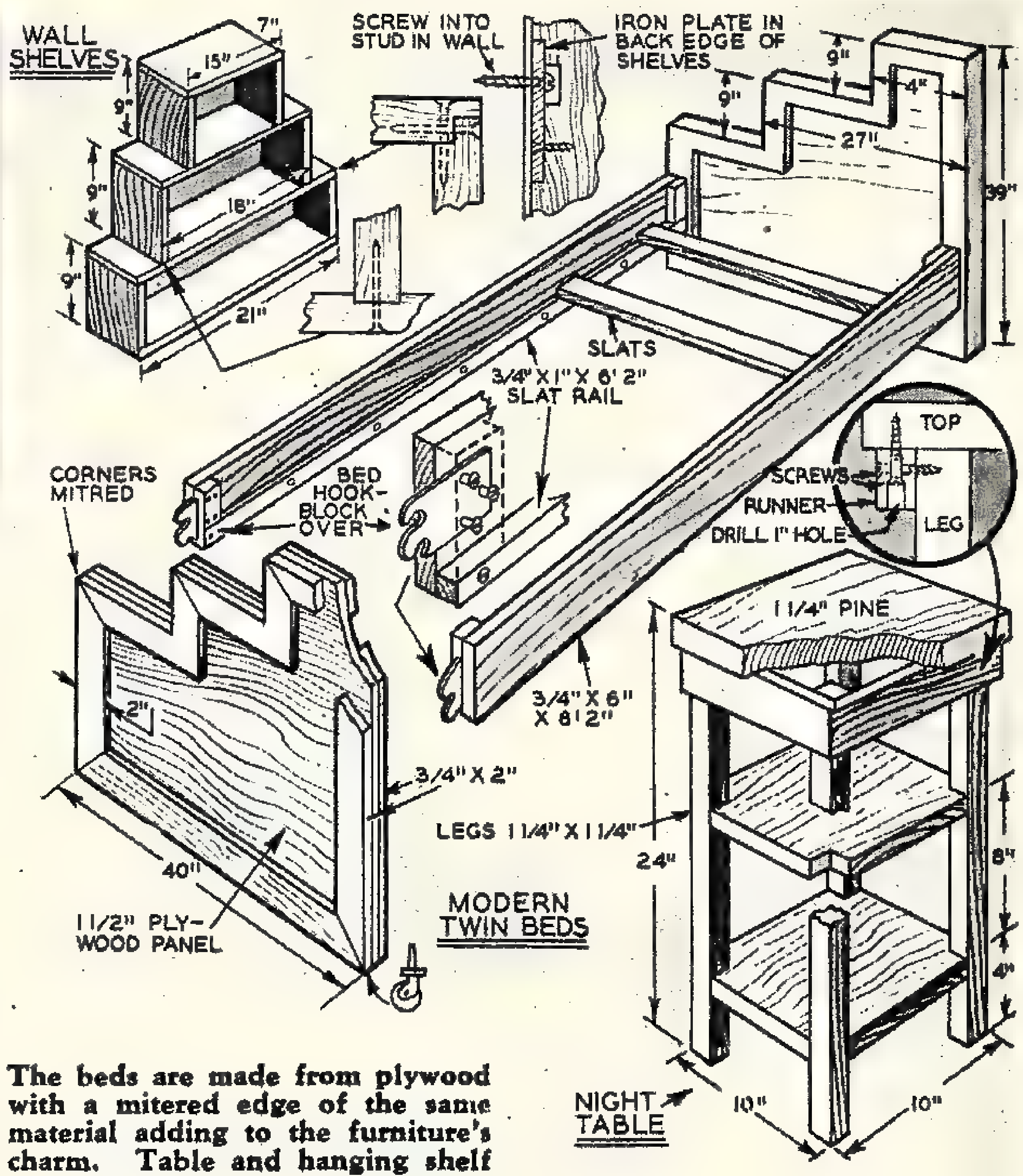
The table top, chair seat and back are finished by covering them with a water-proof plaid material similar to the coverings used on cardtables. Cotton wadding under the material will greatly improve the appearance of the project. After removing all rust particles from the metal it can be enameled in a color that will contrast with the plaid material. Probably the most attractive combination is a red, orange, green or blue plaid with the metal parts finished in silver bronze although any combination may be used.

Twin beds in the modern trend of design supply another idea for the ambitious shopman. The beds, which are ideal for a small guest room, consist of four units; head, foot and two side rails. The head and foot pieces are made of ½" plywood panels with a ¾"x 2" trim around the edge and mitered at the corners. The trim is attached with finishing nails and casein glue after which casters are mounted.

The bed rails are of stock ¾"x6"x6'x2" with bedhooks attached to each end. These being obtainable at any hardware store. Slots cut in the head and foot pieces allow for

Modern TWIN BEDS Are EASY To MAKE

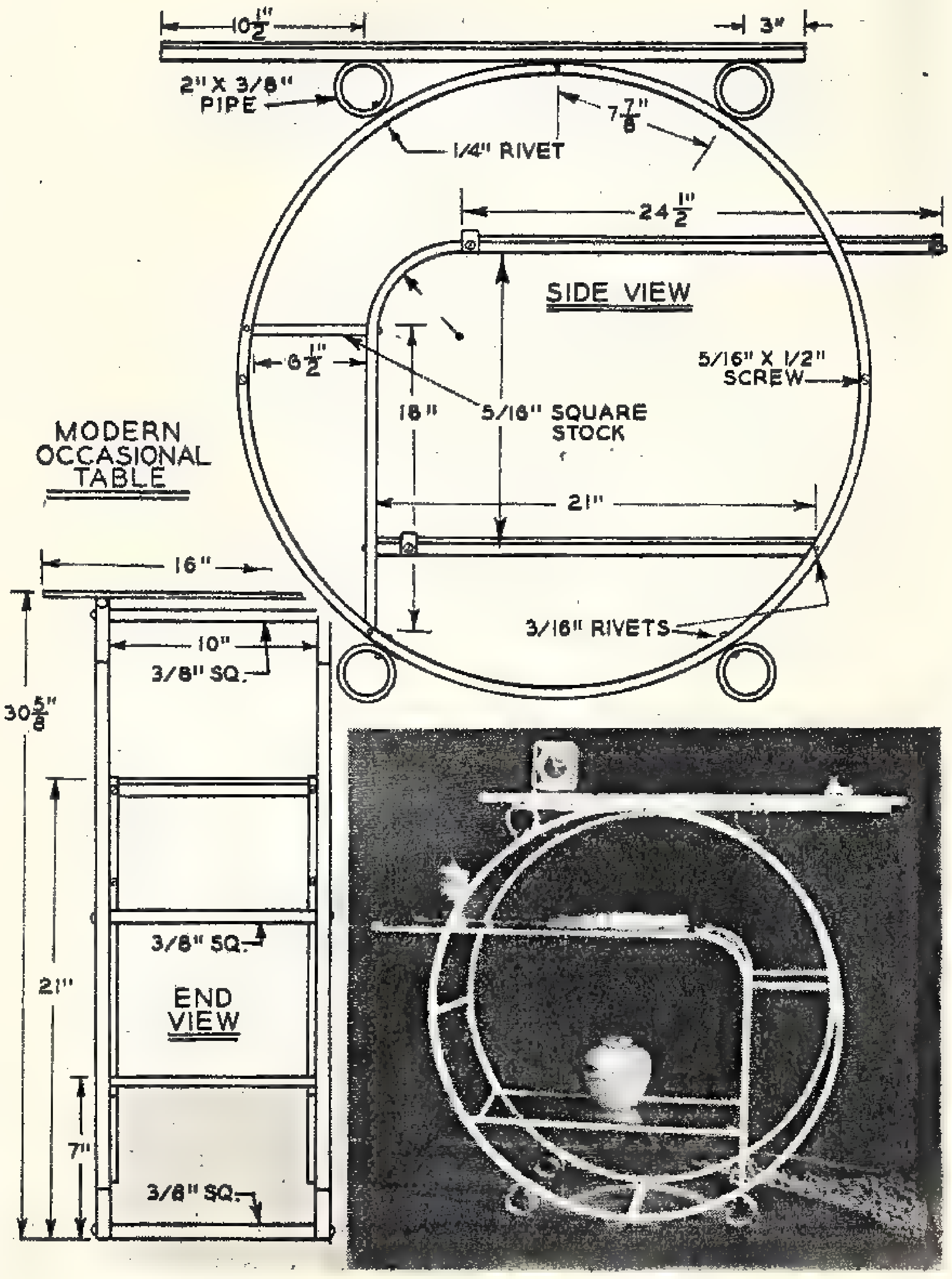
For the small guest room what could be more attractive than a set of modernistic beds? Using standard 37"x72" box springs the bed can be constructed at home with hand tools. The table and rack are also easy to make.


WALL SHELVES
7"
15"
9"
9"
18"
9"
21"
SCREW INTO STUD IN WALL
IRON PLATE IN BACK EDGE OF SHELVES
9"
9"
4"
27"
39"
SLATS
3/4"X1"X 6' 2" SLAT RAIL
TOP
SCREWS
RUNNER
DRILL 1" HOLE
LEG
CORNERS MITRED
BED HOOK-BLOCK OVER
1 1/4" PINE
3/4"X 6" X 6' 2"
2"
3/4"X 2"
LEGS 1 1/4"X 1 1/4"
24"
8"
4"
40"
1 1/2" PLY-WOOD PANEL
MODERN TWIN BEDS
NIGHT TABLE
10"
10"

The beds are made from plywood with a mitered edge of the same material adding to the furniture's charm. Table and hanging shelf are simple and need no explaining.

inserting the rails. After construction is completed sand all parts well and finish in white enamel. A small table and hanging shelf, although extremely simple to build, will greatly improve the room in which the beds are used. These are also painted white so as to harmonize with the other fittings. The last suggestion in the line of modern home furnishings is an occasional table that is ultra-modern in its design. Constructed entirely of metal and plate glass the table is certain to gain the attention of everyone who sees it.

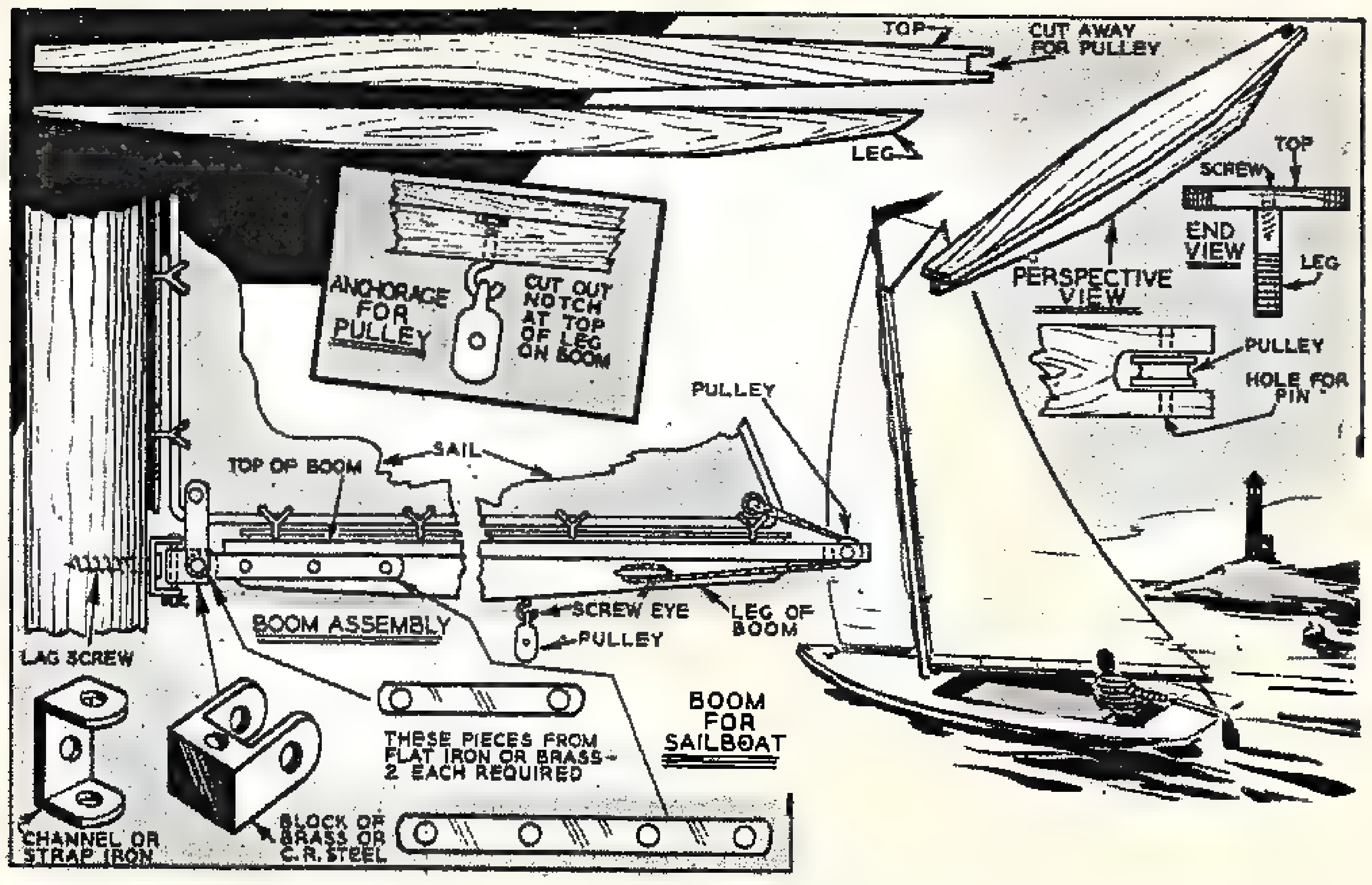
The table is formed from 3/8" and $\frac{5}{16}$" square cold rolled steel, the " 3/8" stock being formed into rings having a diameter of 30". The rings are assembled with lengths of stock measuring 10" in length. The L shaped shelf supports are made of the lighter $\frac{5}{16}$" stock and bolted in place with machine screws. The ring feet and table top supports are cut from 2" pipe and fastened in place with either bolts or rivets. The table is provided with three plate glass sections. The uppermost measures 16"x30", the middle one 10"x24½" and the bottom shelf 10"x21". If desired the glass may be colored or better, a colored plastic material may be used since this material is unbreakable. The metal construction may be finished in white enamel or silver bronze with foot rings in black.


10½"
3"
2"X 3/8" PIPE
1/4" RIVET
7⅞"
24½"
SIDE VIEW
6½"
5/16" X 1/2" SCREW
18"
5/16" SQUARE STOCK
MODERN OCCASIONAL TABLE
21"
16"
3/16" RIVETS
10"
3/8" SQ.
30⅝"
3/8" SQ.
END VIEW
21"
7"
3/8" SQ.

The occasional table at right is made of square steel stock formed into rings and jointed with cross pieces. The shelves are panels of plate glass.

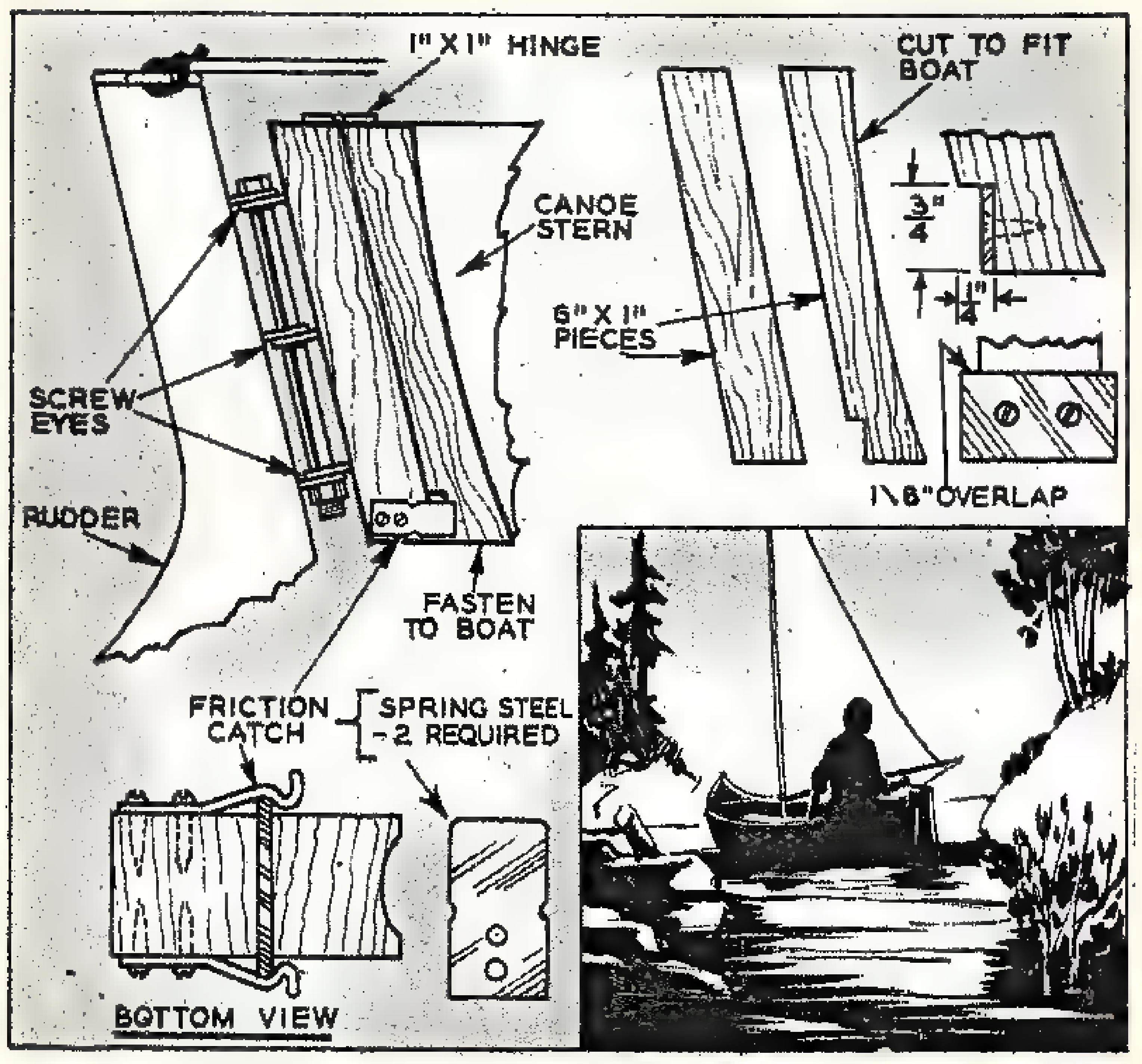
Make a Low Cost Boom For Your Sail Boat

AN INEXPENSIVE boom for small sail craft may be constructed from odd lumber which has been tapered into a top and leg piece, then assembled to form a "T." Angle iron strips are attached to the end of the boom and to these are attached a universal joint made from a block of cold rolled steel or brass. A bracket attached to the mast with a lag screw completes the mounting. Either bolts or pins may be used in mounting the boom to the hinged joint. A slot in one end of the boom allows for the pulley. The sail is attached to this boom in usual manner. No dimensions are given since the construction depends entirely upon the boat on which sail is used.


TOP
CUT AWAY FOR PULLEY
LEG
TOP
SCREW
END VIEW
LEG
PERSPECTIVE VIEW
PULLEY
HOLE FOR PIN
ANCHORAGE FOR PULLEY
CUT OUT NOTCH AT TOP OF LEG ON BOOM
PULLEY
SAIL
TOP OF BOOM
BOOM ASSEMBLY
SCREW EYE
PULLEY
LEG OF BOOM
LAG SCREW
BOOM FOR SAILBOAT
THESE PIECES FROM FLAT IRON OR BRASS– 2 EACH REQUIRED
CHANNEL OR STRAP IRON
BLOCK OF BRASS OR C.R. STEEL

This novel boom is constructed from two pieces of ordinary one-inch stock bolted together to form a "T". No dimensions are given here since measurements depend entirely upon the boat on which the boom is used.

Hinged Rudder Prevents Damage


1" X 1" HINGE
CUT TO FIT BOAT
CANOE STERN
$\frac{3}{4}$"
$\frac{1}{4}$"
6" X 1" PIECES
SCREW EYES
1\8" OVERLAP
RUDDER
FASTEN TO BOAT
FRICTION CATCH
SPRING STEEL –2 REQUIRED
BOTTOM VIEW

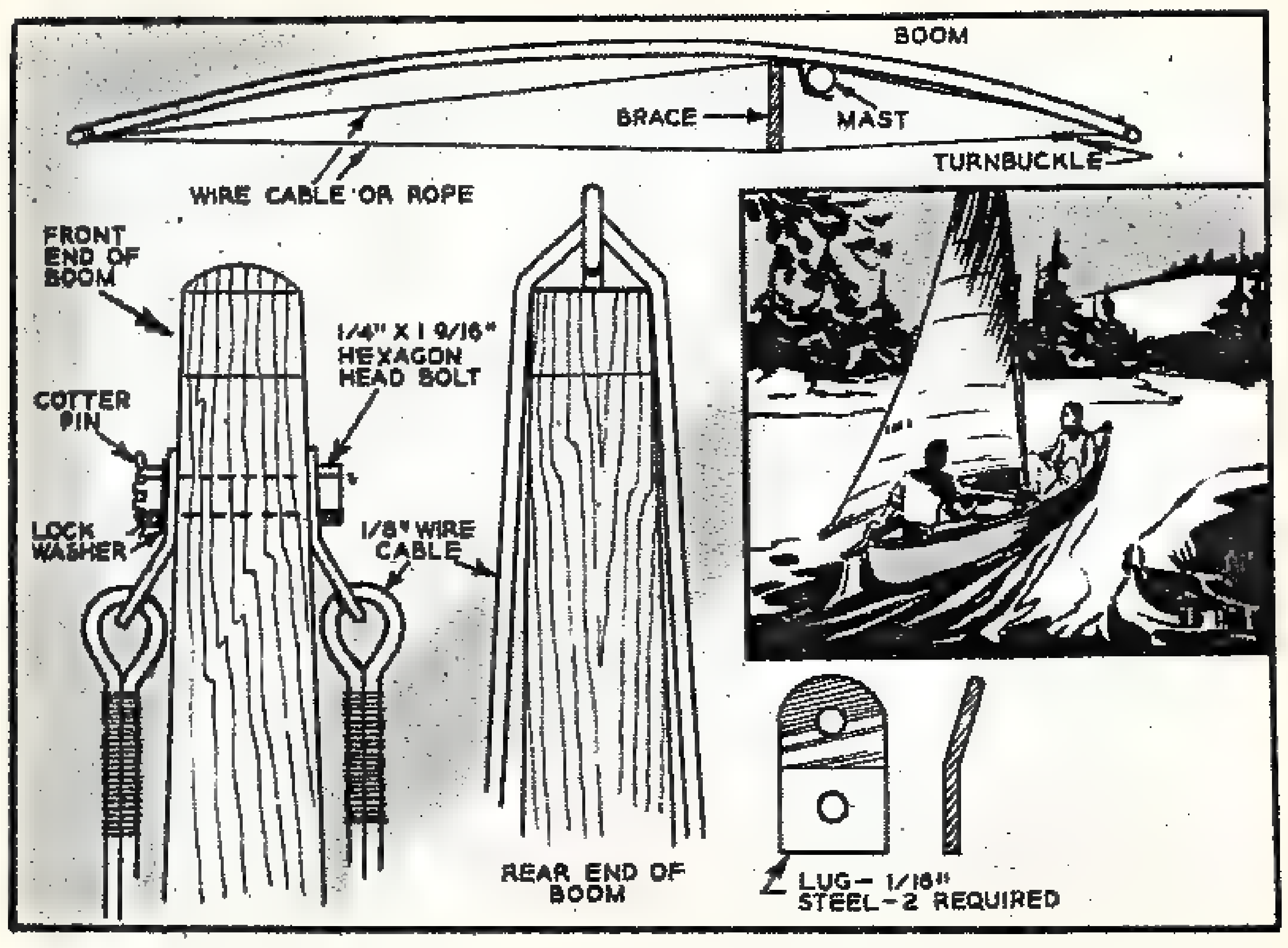
By providing a hinge in the rudder mounting the craft is free from damage if it runs aground. Make the friction catch, as shown above, so that it will hold the rudder when sailing.

PROVIDING your canoe with a rudder that will swing upward when it strikes an obstruction or is beached, will eliminate damage to your boat in the future. Cut a 6″x1″ piece of hardwood to match the curvature of the boat then mount this to the stern. A similar piece of wood is attached to the first using a hinge and a friction catch. The regular rudder is then installed to the hinged section with screw eyes. The hinge and catch on the 6″x1″ strip allow for rudder's release.

Bent Boom Increases Sailing Speed

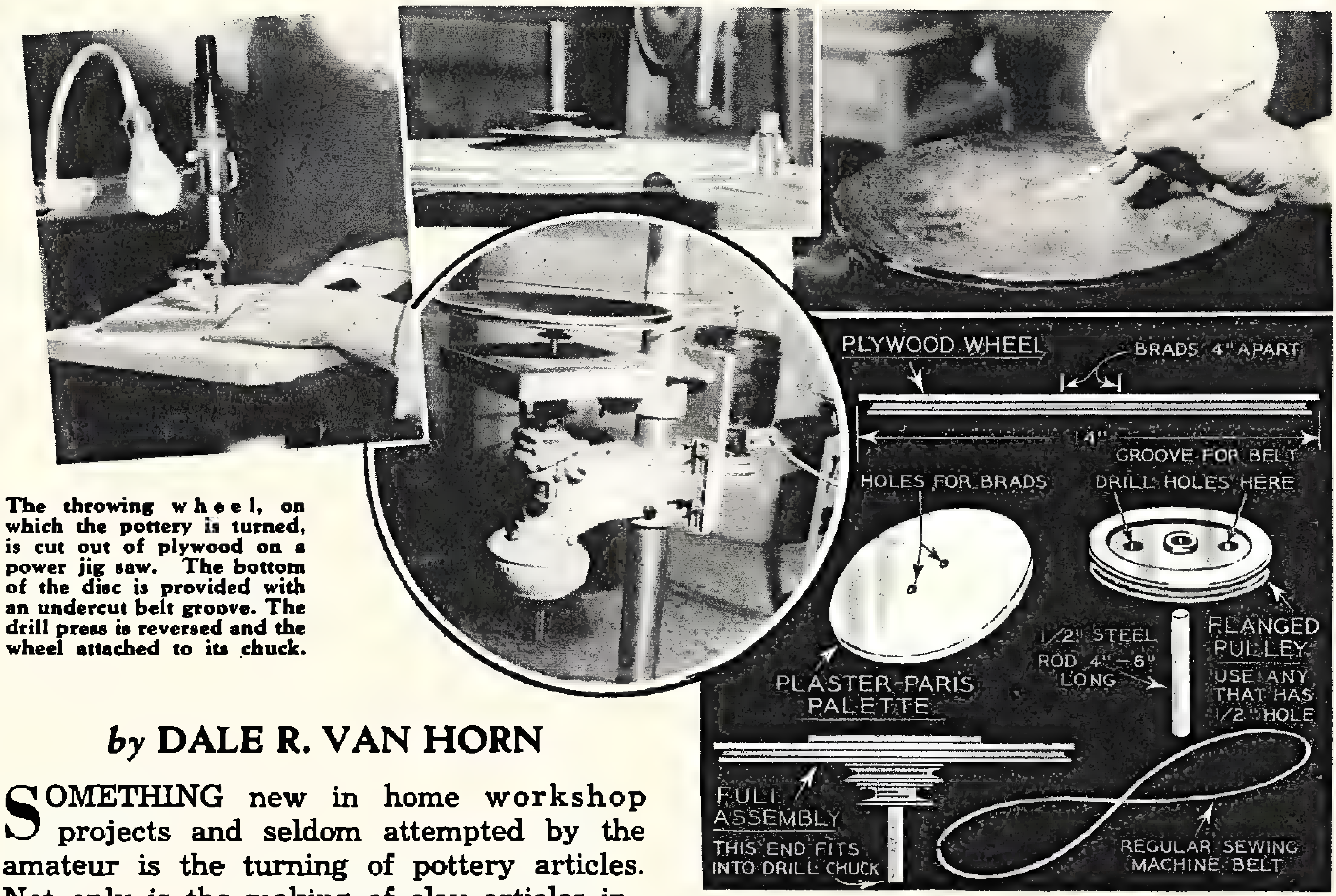
NAVAL architects claim that the use of a bent boom will increase the performance of any light sail boat since the curve allows the wind to supply more pressure to the sail. To bend the boom on a light craft drill a hole in the front of the boom large enough to pass a ¼″x1$\frac{9}{16}$″ hex bolt to which has been attached two steel lugs. On the opposite end of the boom fasten a screw eye large enough to pass ⅛″ diameter steel yacht rigging cable.

Splice one end of the steel cable to a lug then thread it through the eyelet on the other end of the boom returning it, finally, to the starting point. A turnbuckle is used to draw the cable taut. Make a brace from a piece of hard stock so that when finished it measures ¾″x1¼″x12″ and insert this between boom and cable just opposite mast as illustrated.


BOOM
BRACE
MAST
TURNBUCKLE
WIRE CABLE OR ROPE
FRONT END OF BOOM
1/4" X 1 9/16" HEXAGON HEAD BOLT
COTTER PIN
LOCK WASHER
1/8" WIRE CABLE
REAR END OF BOOM
LUG– 1/16" STEEL–2 REQUIRED

By bending the boom to the curvature shown at the top of this diagram the efficiency of any boat is increased by at least 20%. A steel yacht cable permits boom to be bent bow-like.

TURNING CLAY PROJECTS on



The throwing wheel, on which the pottery is turned, is cut out of plywood on a power jig saw. The bottom of the disc is provided with an undercut belt groove. The drill press is reversed and the wheel attached to its chuck.

A steel flanged pulley screwed to the bottom of the plywood disc completes the throwing wheel assembly. A short length of ½-inch steel shafting connects to the flanged wheel and the drill press chuck as described above. Plaster of Paris palette is attached to the top of the wheel with small brads. A regular sewing machine belt transmits the power from motor to wheel.

by DALE R. VAN HORN

SOMETHING new in home workshop projects and seldom attempted by the amateur is the turning of pottery articles. Not only is the making of clay articles interesting, but simple if your shop includes a floor type drill press.

The extreme rigidity of the modern drill press makes its adaption to turning a potters' wheel ideal. The first step is to reverse the chuck and motor position with the chuck under the table and centered with the center hole. To bring the end of the motor shaft in line with the wheel groove it was necessary to cut out a board for the purpose, drill the necessary holes, then bolt it to the motor support as a photo shows.

The largest wheel possible to use with this drill press is one about 14 inches in diameter, so this was cut from 5-ply wood with the jig saw. To utilize as much of this large diameter as possible for speed reduction, yet get the belt just under the edge where occasionally mud and water would not work under it, a groove was cut with one of the shaper knives to the shape shown. An ordinary sewing machine belt was used.

Two turns of friction tape wrapped about the motor shaft itself and the belt run directly on the shaft will provide an ideal speed of about 114 R. P. M. A belt tightened with

Suitable clay for pottery work may be secured from a local brickyard for a few cents. The clay is handled in the same manner as dough after which it is rolled out, as illustrated above, into long rolls using a flat board for the working tool. In making the coils it is advisable not to have the clay too moist, otherwise it may stick to the forming tools.

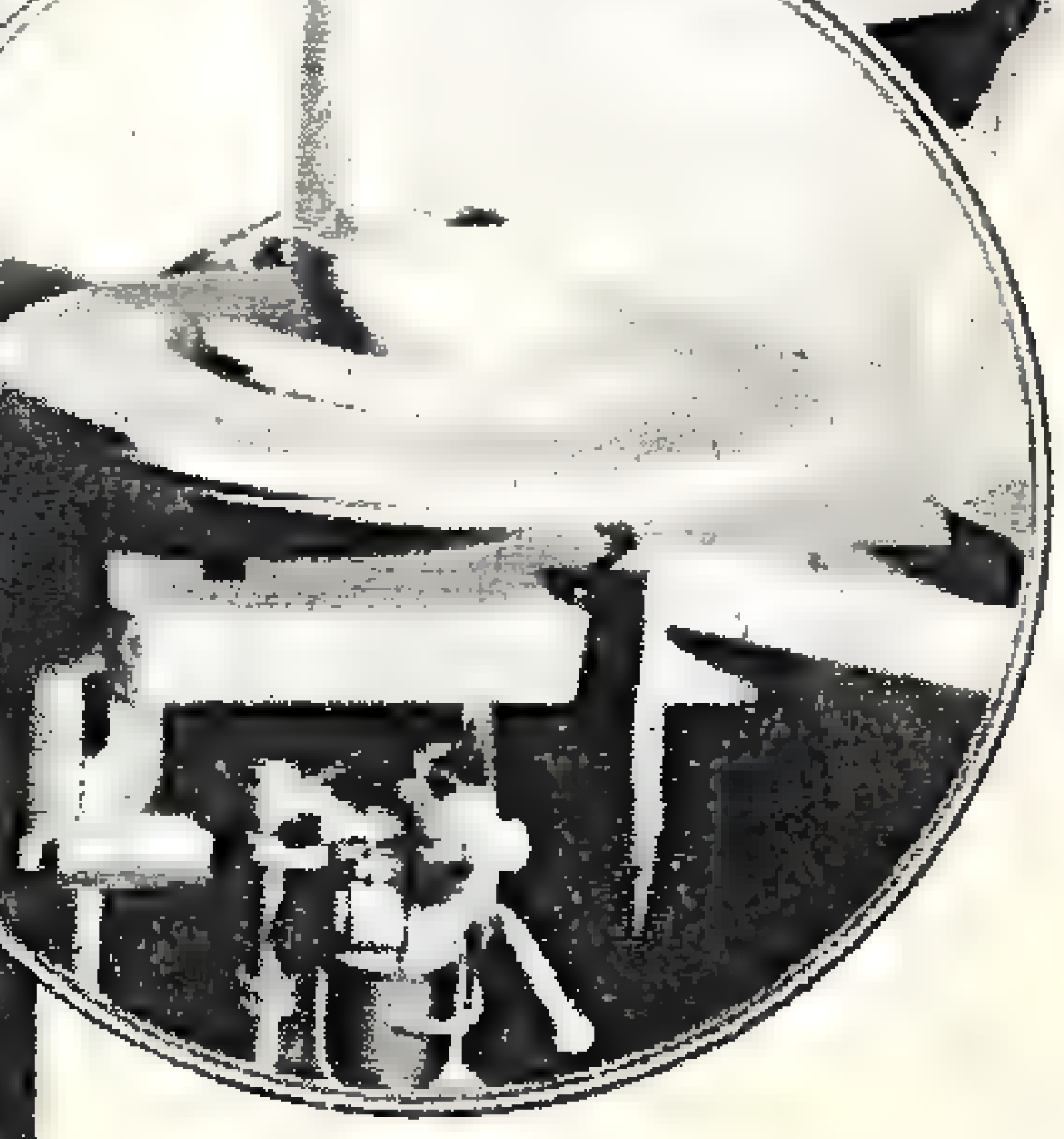
A POTTERS' WHEEL

Attractive vases, crocks and jars of baked clay can be produced in the home workshop. An ordinary drill press forms the basic throwing wheel equipment.

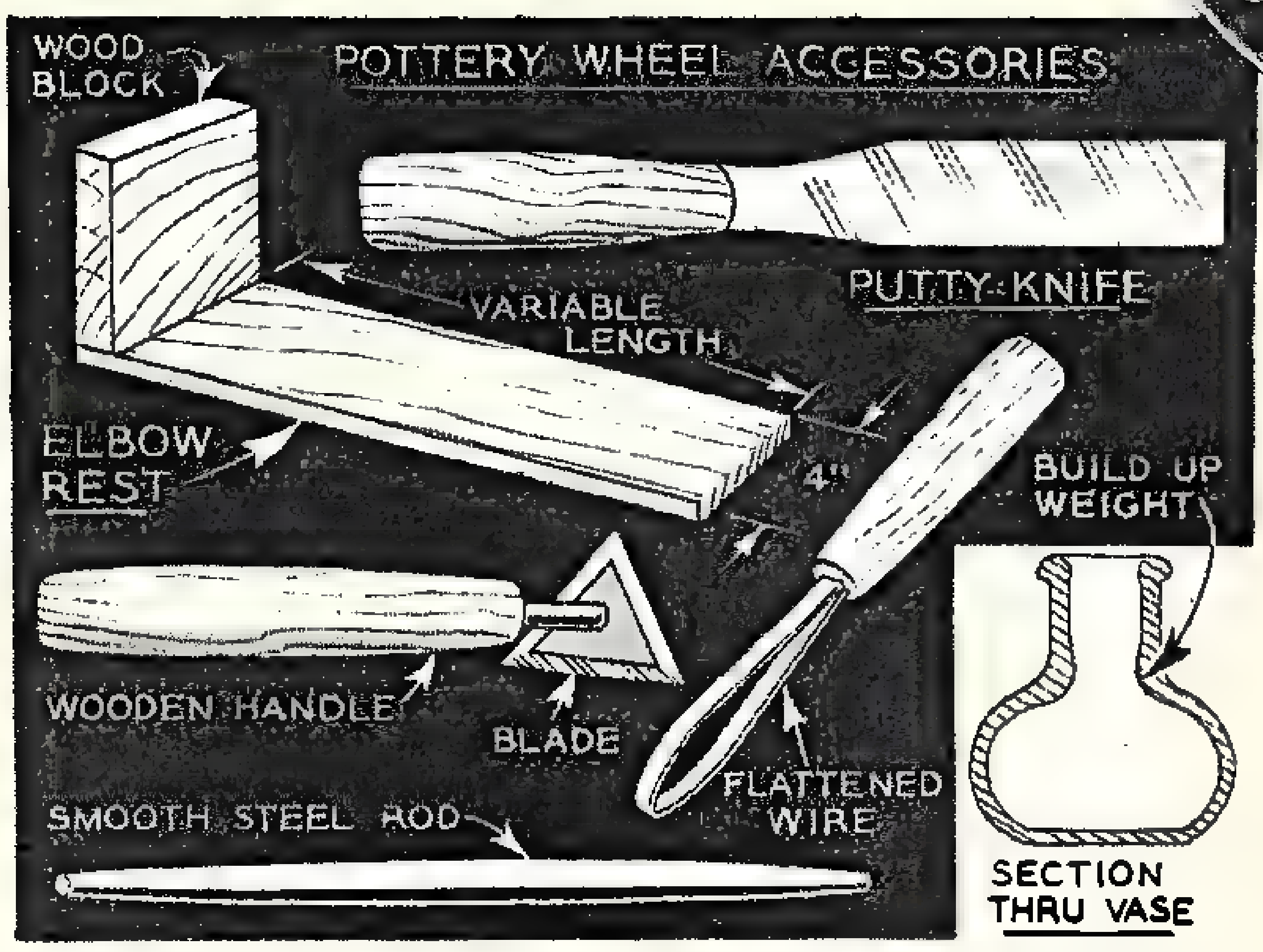
an idler pulley to be operated with the foot will provide graduated speeds. This can be clamped to the drill press table and removed when wanted. Of course, with a little practice you will be able to turn out nice pottery pieces with the constant speed wheel.

Floor flanges are not accurately drilled, so a better line up results if any ordinary grooved pulley fitting a half inch shaft is drilled for 2, 3 or 4 screws midway between rim and center and this fastened to the exact center of the plywood wheel with wood screws. The 4 or 6-inch half inch shaft is then fastened in the pulley wheel with the set screw provided, and the other end of the half inch shaft set tightly in the drill chuck.

Start the project by applying a pliable lump of clay to the plaster palette then with the throwing wheel turning at a speed of about R. P. M. spread out the lump with a broad putty knife as shown here.



Above is pictured one of the completed pieces of pottery turned on the home throwing wheel with the various stages in its construction shown below. Note that the clay rolls are placed around the palette gradually and more added as the bottom is completed. The neck of vase is added last and this turned to shape, carefully.



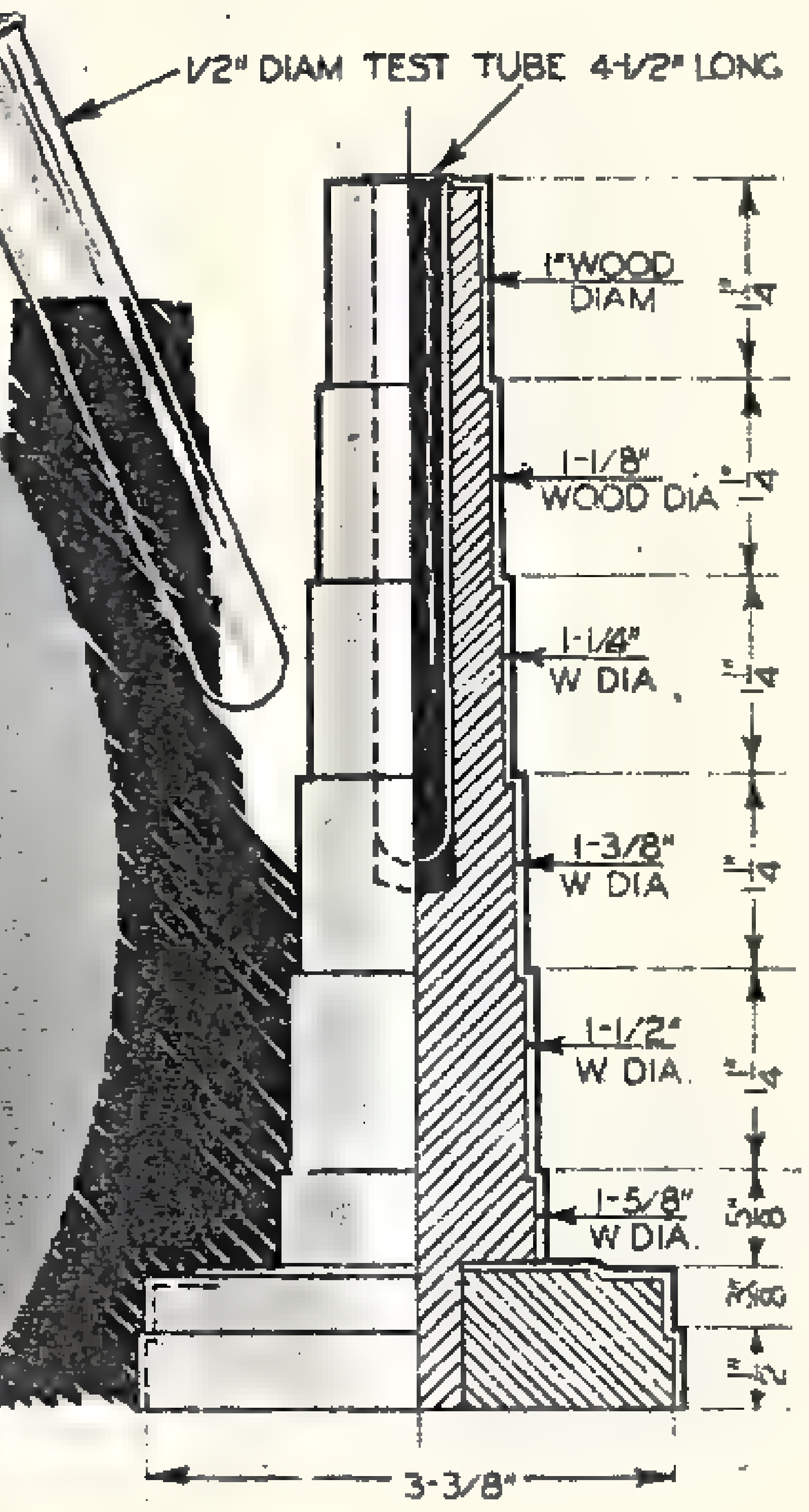
Only simple homemade tools are required for turning pottery projects. These consist of a simple elbow rest, a flexible putty knife, steel rod and clock spring mounted on a handle.

The wood wheel should be given a double coat of clear lacquer or varnish and special attention given the rim, both top and bottom, to render water proof.

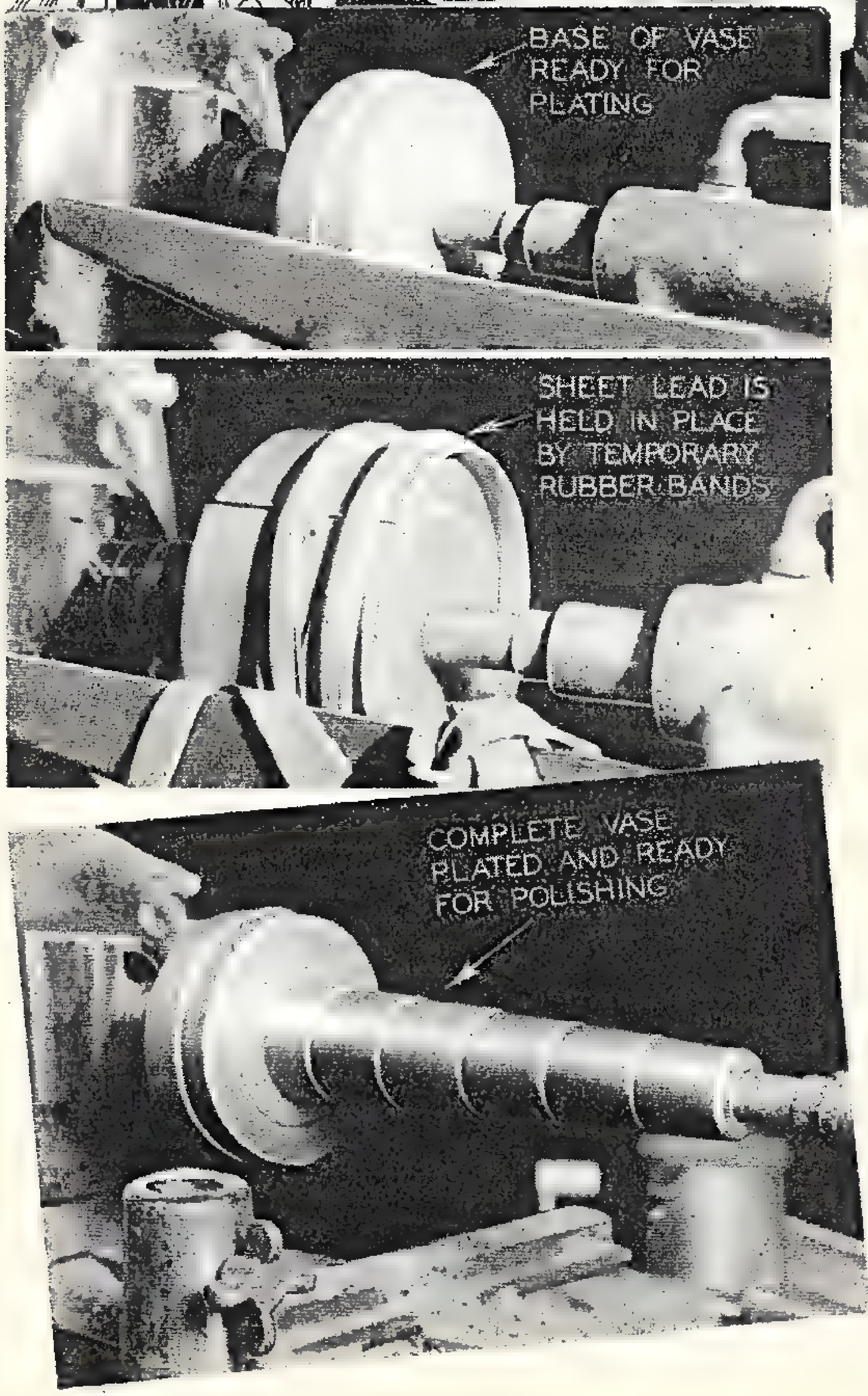
Two or more palettes should be made from plaster of Paris. Mix the plaster and pour it out on a flat surface to harden. Then drill two holes to fit the brads in the wood wheel, drop in place and with a file tang held vertically and the wheel in motion, cut through the surplus plaster to leave a round palette upon which pottery is to be made.

[*Continued on page* 128]

A LEAD PLATE BUD VASE



The above dimensions are for the inside wood core. After lead is formed over wood the dimensions will be slightly greater due to lead being $\frac{1}{16}$" thick. In the center picture is shown the lead vase after completion.


BASE OF VASE READY FOR PLATING
SHEET LEAD IS HELD IN PLACE BY TEMPORARY RUBBER BANDS
COMPLETE VASE PLATED AND READY FOR POLISHING

Turn down the base from any available stock following the dimensions shown in the upper right hand corner of the page. The base appears in the top picture in this group. In the center is shown the manner in which sheet lead is attached to base, for forming, with rubber bands. The bands hold lead in place so that seam may be soldered rigidly. The lead is attached to the upright wooden turning in the same manner. A maple dowel serves as lead forming tool. Vase should appear as shown in lower photo after forming is completed.

SHOPMEN who like to make things that are different will find this novelty bud vase an interesting lathe project. The materials used are wood, metal and glass, with a test tube doing duty as a container.

Fasten a wood block to the small center screw face plate on your lathe and turn it down to a thickness of one inch. This done turn down the outer ⅜ inch of the diameter to ⅞ inch thickness. The diameter for the first ½ inch is 3⅜ and the next ⅜ inch, 3¼ inches in diameter. Insert a small drill into the center until it touches the face plate screw to guide the drill accurately when the center hole is bored for the tenon of the upright.

The upright is turned from a piece of scrap 2"x2"x8", with a final height of 7¾ inches including the ½-inch tenon turned at the bottom. Turn down the upright as shown then sand smooth and remove. Replace the base on the lathe, cut a strip of $\frac{1}{16}$" sheet lead for the base edge, trim the ends so they just meet and hold secure with wide rubber bands. Solder where the seam is exposed, then shift the rubber and finish soldering. With a slow lathe speed, trim and true this lead sheet, using a wood turning chisel, then with a maple dowel and the end of a candle for lub-

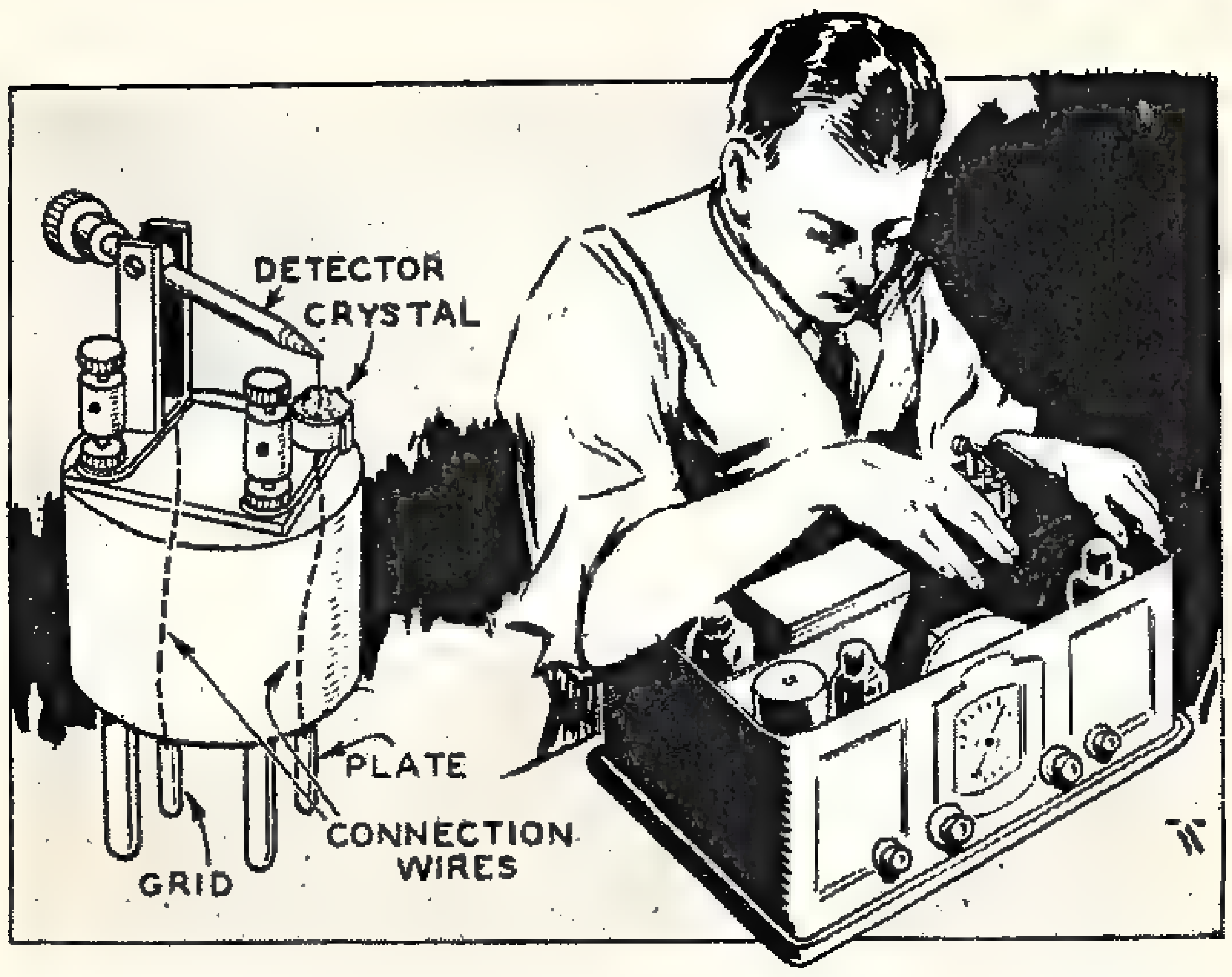
[*Continued on page* 120]

RADIO SPARKS

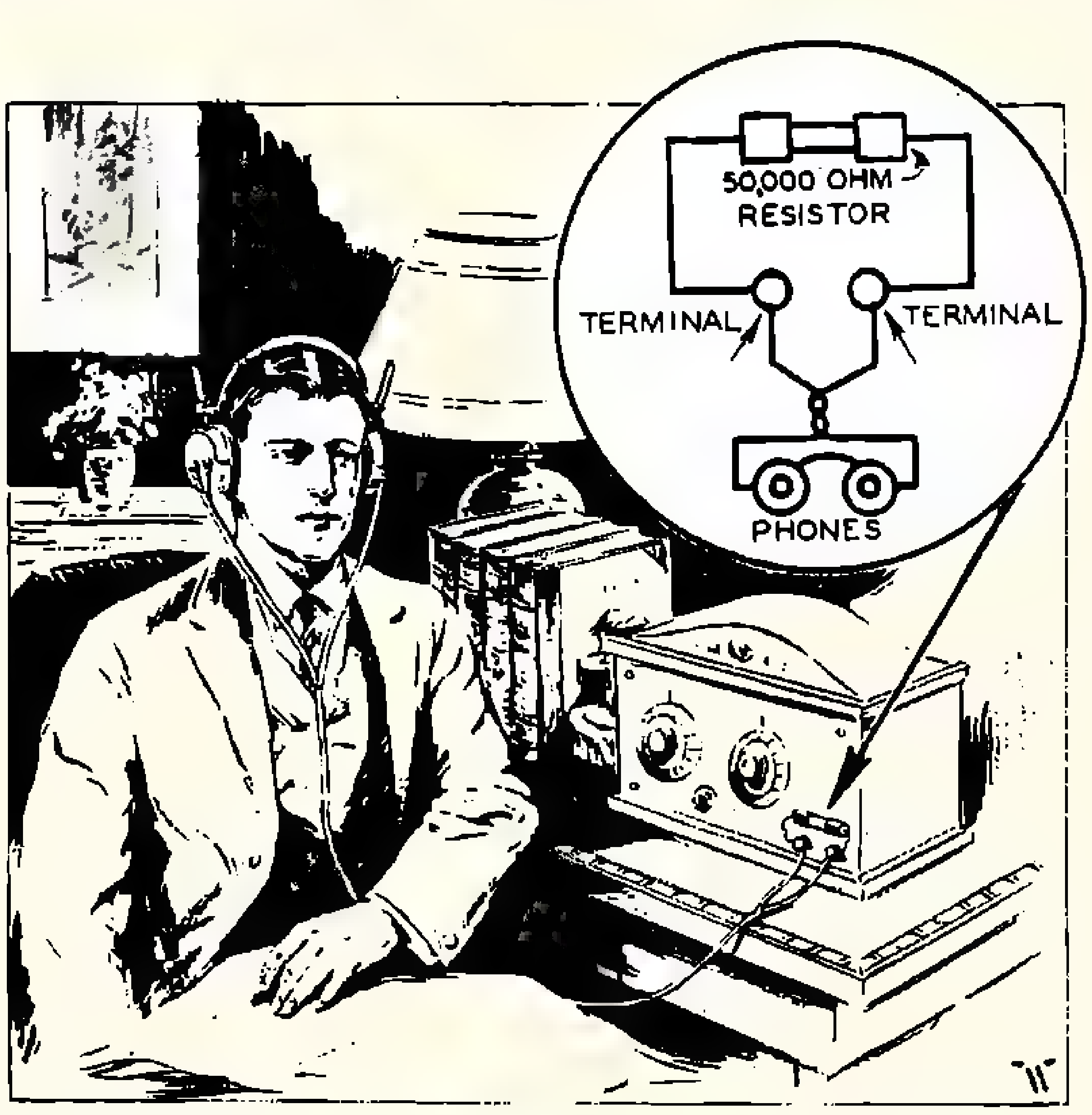
RESISTANCE REPAIRS DAMAGED HEADPHONES

THERE are still many radio fans and experimenters who find headphones valuable for tuning in distant stations or listening to programs during the late hours of the evening. For those, this kink will be of special interest and for others it is well worth knowing. When headphones suddenly go dead the cause is usually due to an open coil in the phone unit. To correct the trouble secure a 50,000 ohm carbon resistance of the "pig tail" variety and connect it across the earphone terminals of the set and the phones will again function although some of volume will be lost.

Since headphone coil units are connected in series one little wire breaking will result in the entire headset failing to work. While the resistance method is ideally suitable for a temporary repair job it is advisable to check the coils for the open circuit and make the necessary repairs by unwinding the fine coil wire until the break is located then soldering the fine wires carefully together and winding the coil to its original condition. Since the fine magnet wire used in the earphone construction is usually enameled the enamel must be carefully removed before any attempt is made to solder the broken leads.



A crystal detector unit connected to a four prong tube base as described in the above illustration will make a practical tube substitute when one of the set's tubes suddenly fails.



When a pair of earphones suddenly refuse to function it is often possible to correct trouble by connecting a 50,000 ohm resistance across the receiver phone terminals as shown here.

Crystal Is Handy Tube Substitute

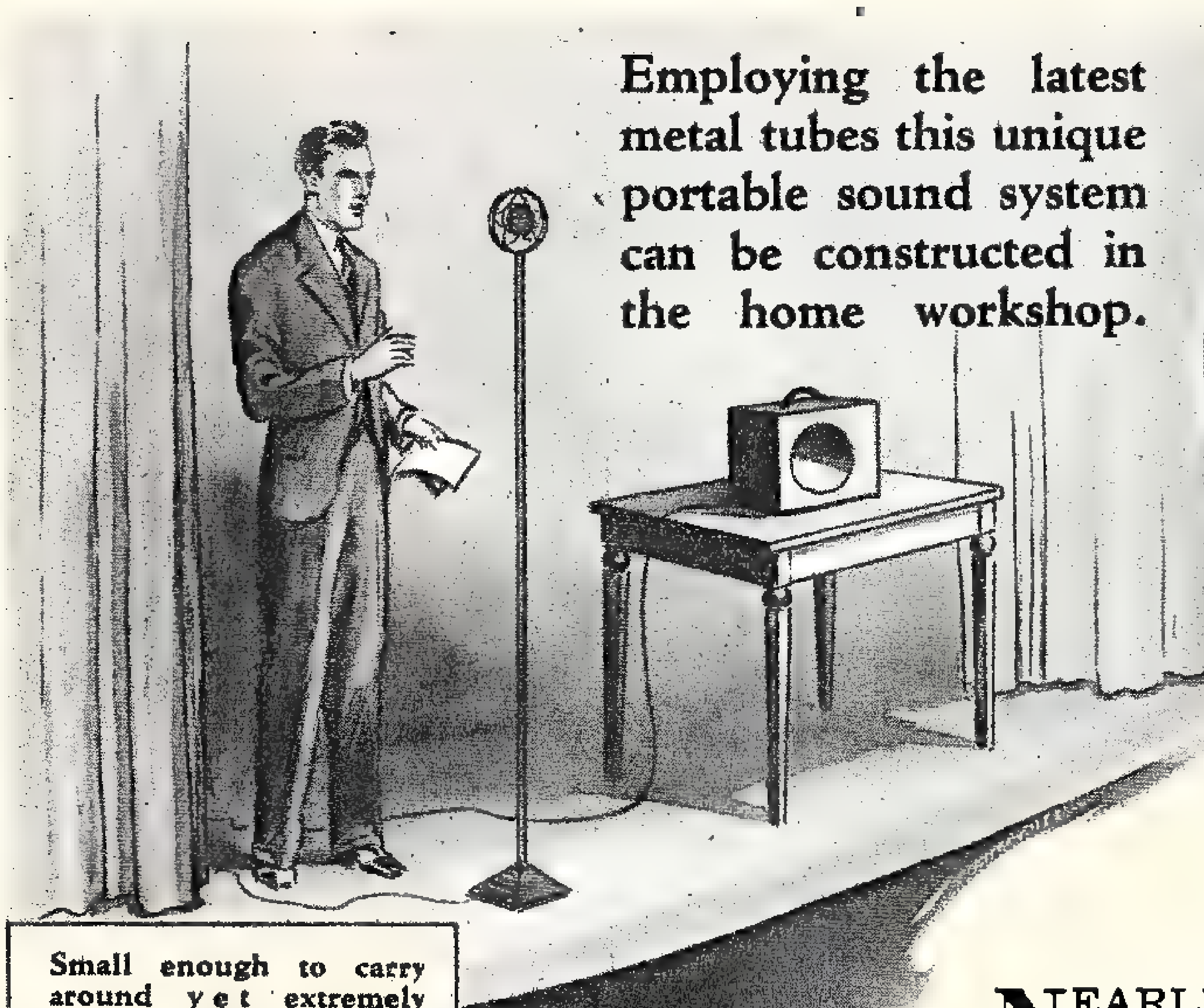
ON EARLIER types of electric receivers and practically all battery sets a crystal detector makes an excellent tube substitute. For the experimenter who likes to try new stunts this one should prove most effective since the volume of the receiver will depend upon how careful the "catwhisker" has been adjusted on the crystal.

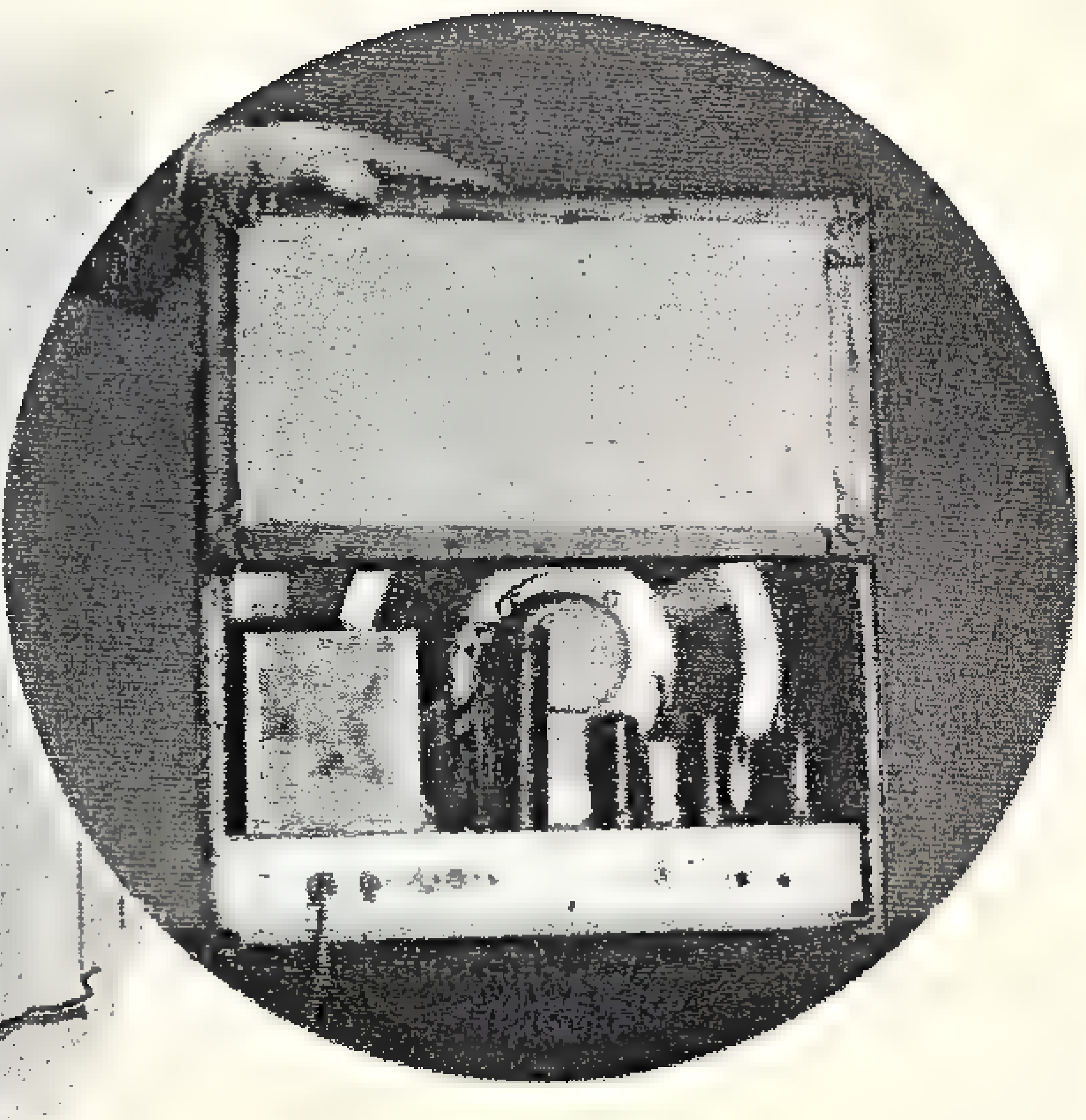
First secure a crystal detector unit and mount this on a 4-prong tube base using heavy copper wire to hold it rigid. If desired, of course, a fixed detector can be used instead of the adjustable type. The leads connect to the plate and grid prongs of the tube base, these being the two small ones; the large prongs are left disconnected.

When a tube suddenly burns out and a replacement is not on hand insert the crystal into the socket in question, adjust the "catwhisker" carefully and once more the set is in working condition.

"MM METAL TUBE MASTER"—

Employing the latest metal tubes this unique portable sound system can be constructed in the home workshop.

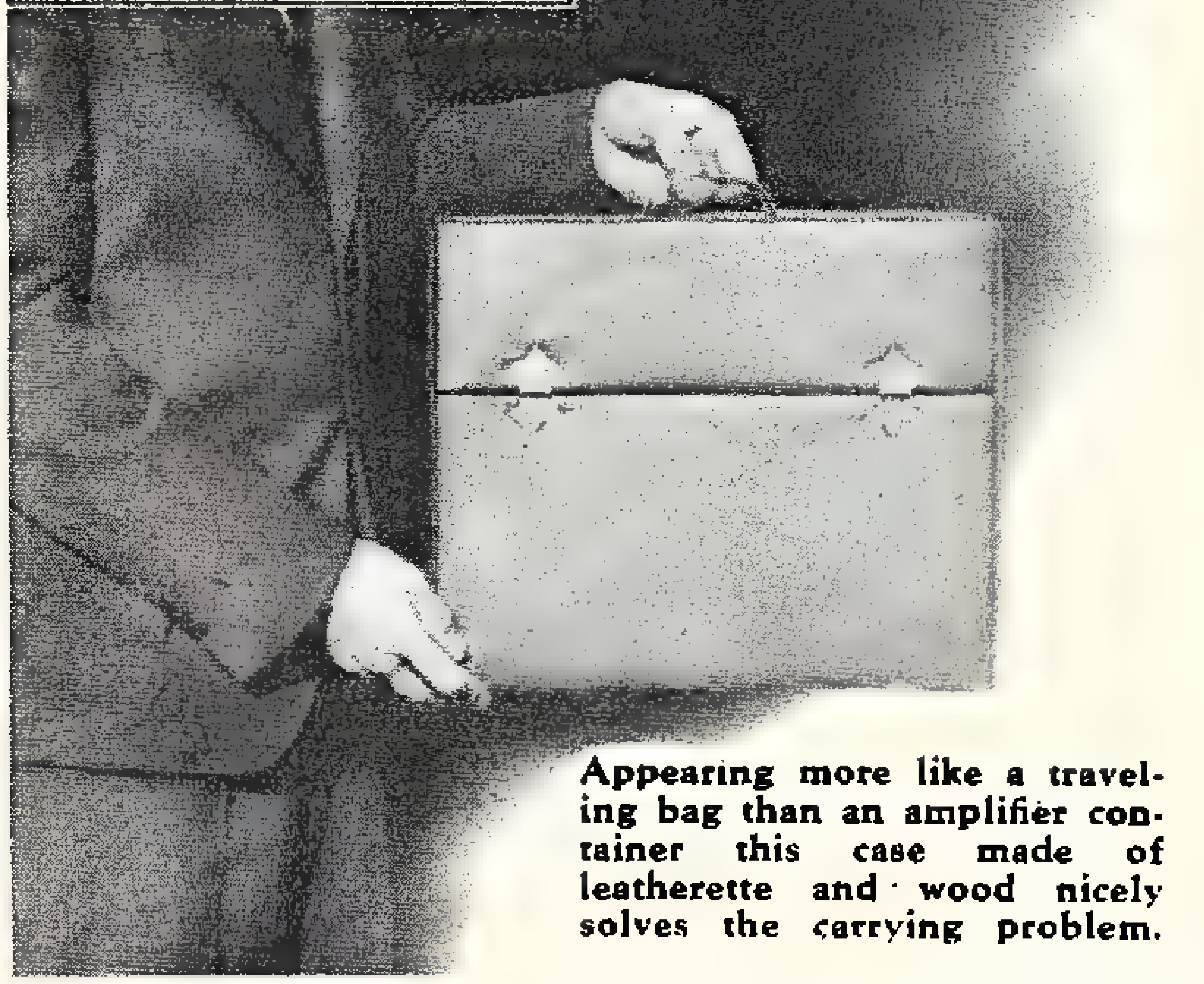




Above is shown a rear view of the MM Master with the lid of the cabinet raised. The speaker attaches to the chassis.

by **J. R. MACK**

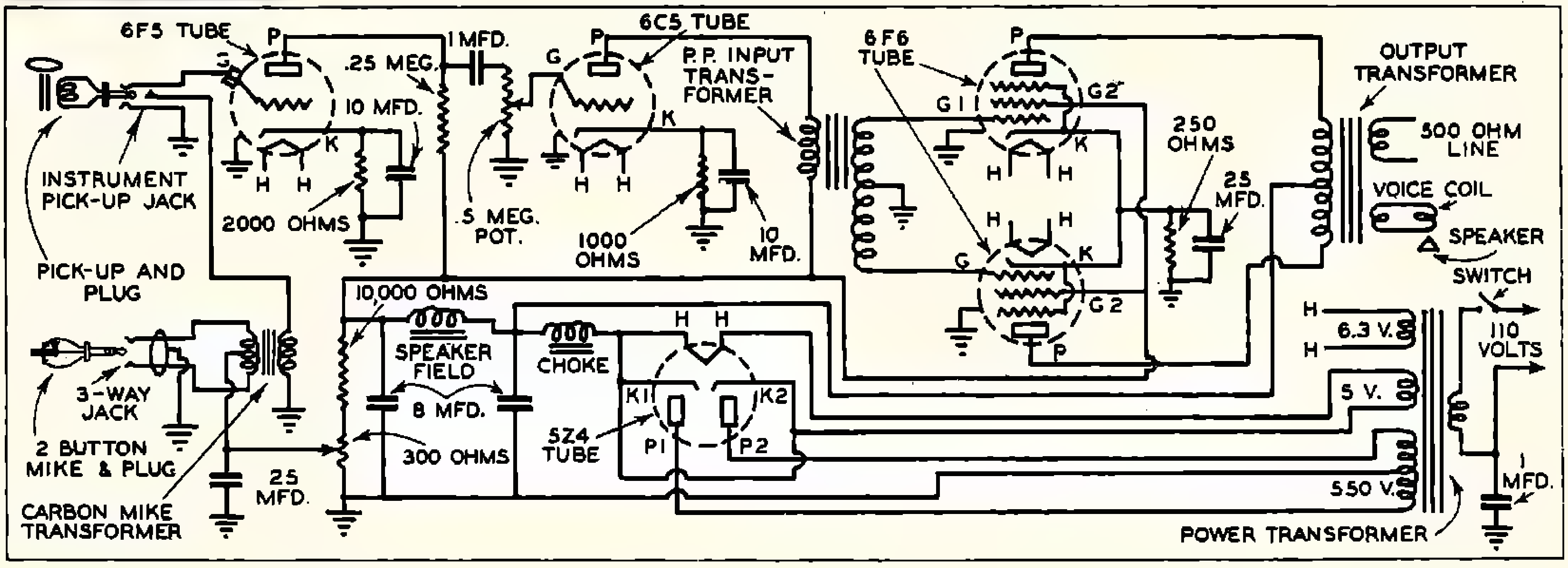
Small enough to carry around yet extremely powerful, MM Master is an ideal sound system.



Appearing more like a traveling bag than an amplifier container this case made of leatherette and wood nicely solves the carrying problem.

NEARLY everyone at some time has wished for his own portable public address system either for supplying music for a party or in making announcements at outdoor gatherings. Practical portable sound systems are usually expensive, therefore placing them beyond the reach of the average income. Realizing this fact an amplifier was decided upon which could be constructed by anyone the least bit familiar with radio. Through the use of modern metal tubes and a high-gain circuit the completed public address system offered all of the advantages of the expensive equipment yet it cost less than $25 to build.

Parts for building the amplifier may be purchased from any mail order or local radio


6F5 TUBE
P
G
.25 MEG.
1 MFD.
10 MFD.
K
H H
INSTRUMENT PICK-UP JACK
2000 OHMS
PICK-UP AND PLUG
6C5 TUBE
P
G
P.P. INPUT TRANS-FORMER
K
H H
.5 MEG. POT.
1000 OHMS
10 MFD.
10,000 OHMS
SPEAKER FIELD
CHOKE
H H
8 MFD.
K1
K2
5Z4 TUBE
P1
P2
300 OHMS
3-WAY JACK
2 BUTTON MIKE & PLUG
CARBON MIKE TRANSFORMER
25 MFD.
6F6 TUBE
P
G1
G2
K
H H
H H
G
K
G 2
P
250 OHMS
25 MFD.
OUTPUT TRANSFORMER
500 OHM LINE
VOICE COIL
SPEAKER
SWITCH
H
H
6.3 V.
110 VOLTS
5 V.
1 MFD.
550 V.
POWER TRANSFORMER

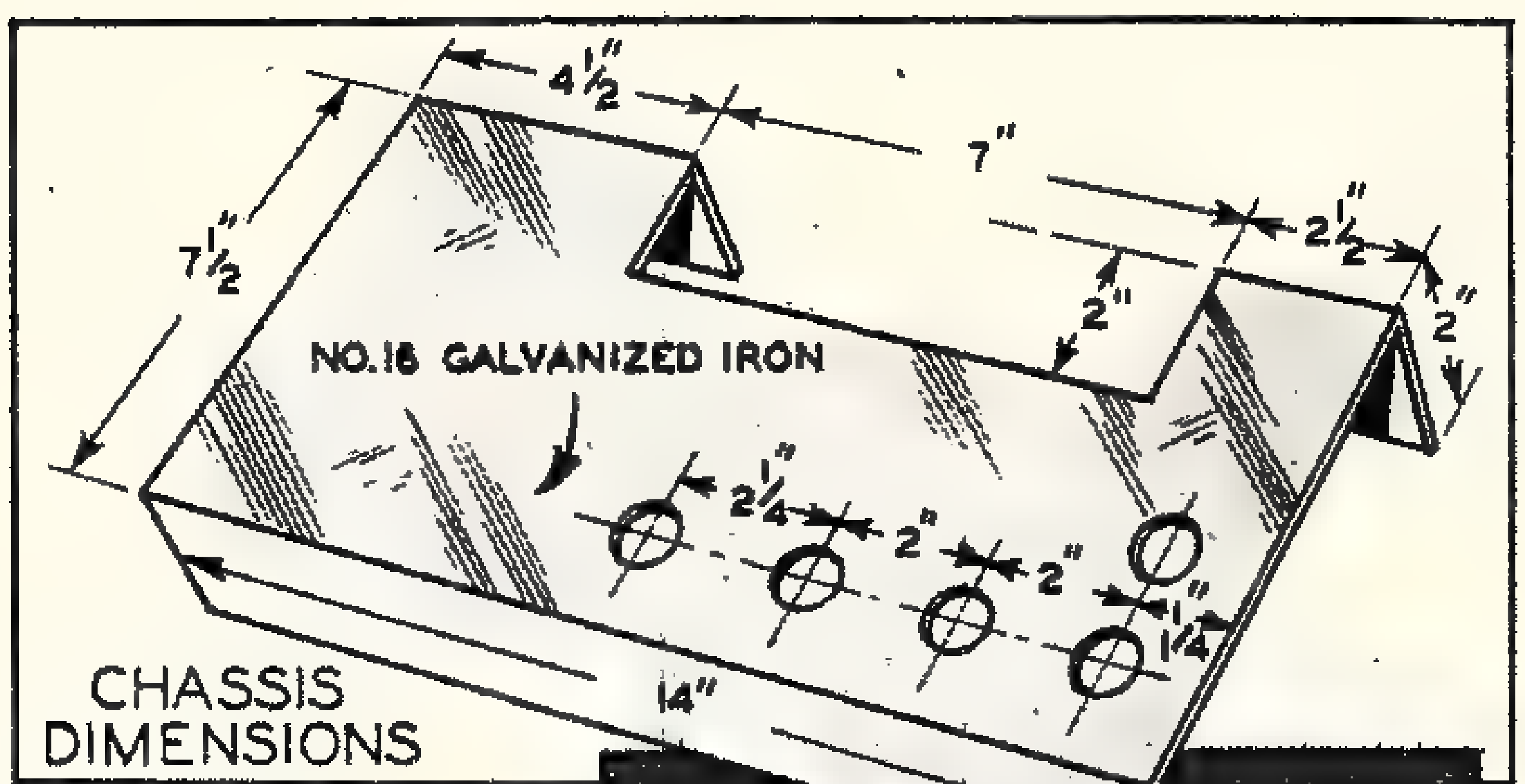
The experienced radio builder will find this schematic diagram helpful in wiring up the amplifier. Wherever possible connect leads directly to the ground so as to eliminate all unnecessary wiring. Pick-up and microphone jacks should be insulated from panel. Since all metal tube sockets have the same number of prongs care should be exercised so that connections are made correctly. Although indicated at 550 volts, power transformer can have plate voltage output of slightly more or less than this.

A PORTABLE SOUND SYSTEM

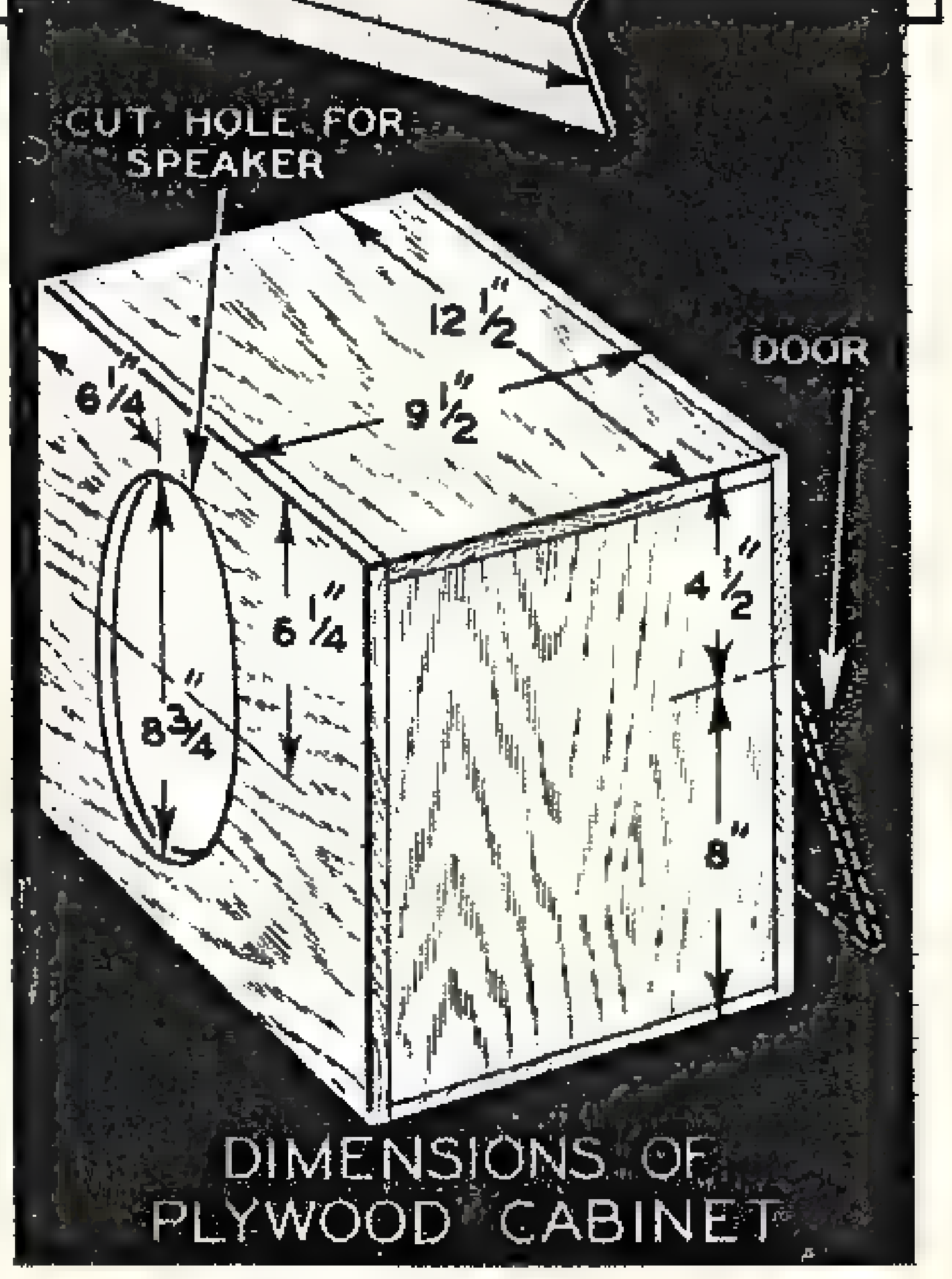
supply house including the metal chassis although it is quite simple to make this yourself from No. 16 galvanized sheet iron. The panel is laid out according to the dimensions given on the diagram and then bent to shape. Any tinsmith will do this work for you for a small charge.

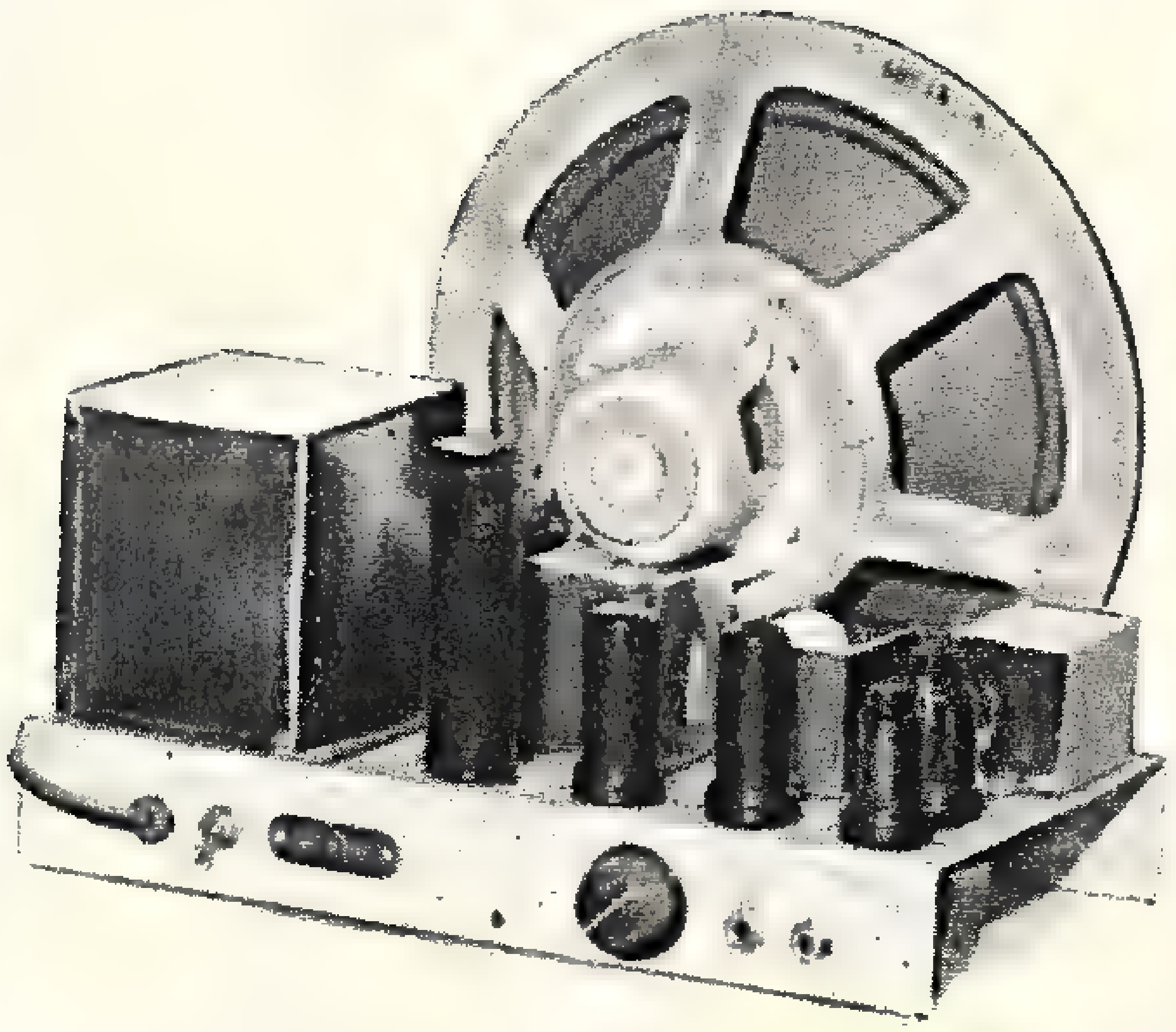
The sockets for the metal tubes are installed first, after which the power transformer, A. F. transformers and other mountable items are fastened in their respective positions. The speaker is a 12-inch dynamic type mounted to the front of the chassis with machine screws. The field coil winding of the speaker serves as the filter choke thus saving valuable chassis space. A type 5Z4 tube serves as the rectifier with two 8-mfd. electrolytic condensers providing the necessary filter capacity.

[*Continued on page* 124]

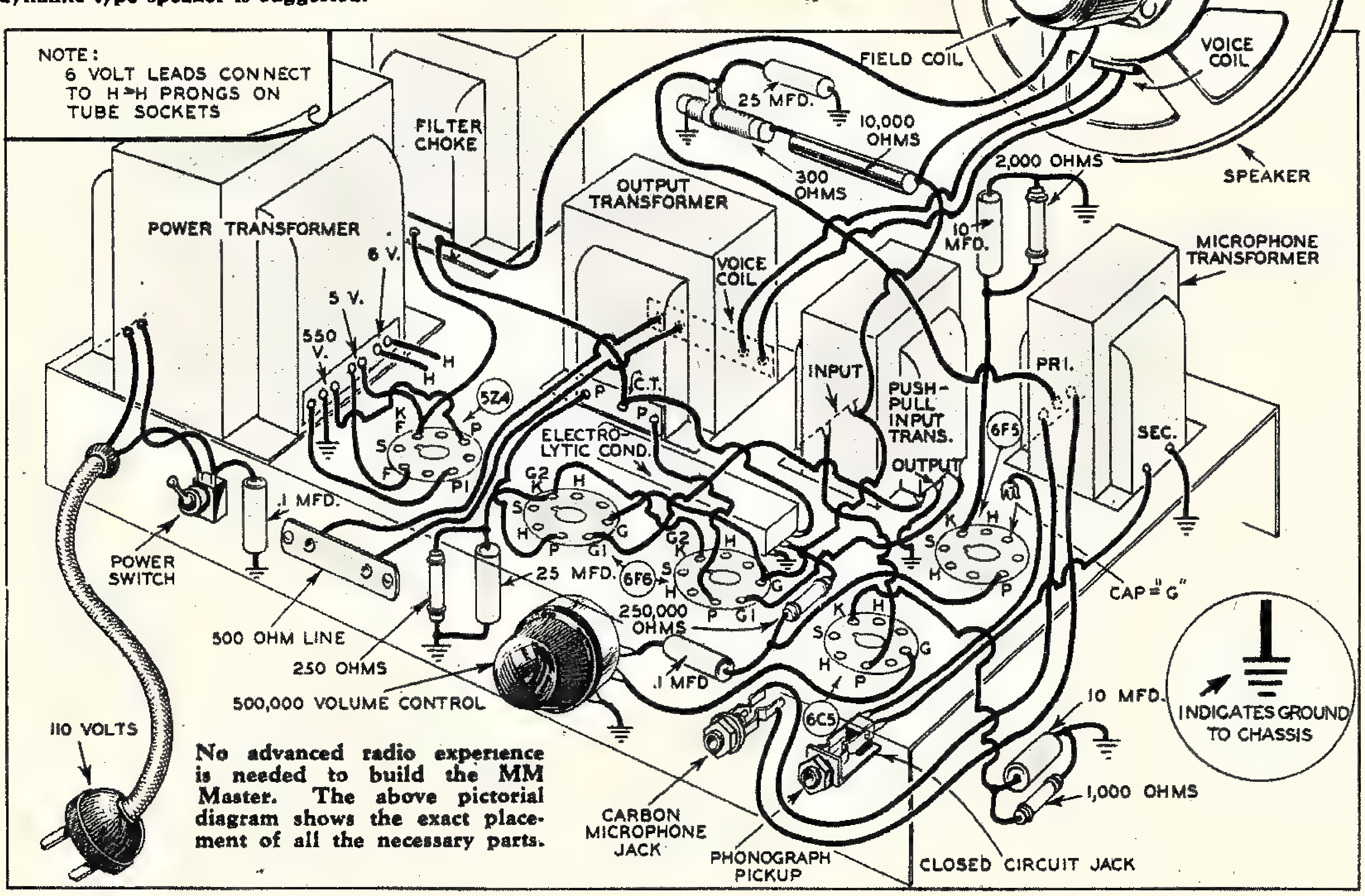

4½"
7"
2½"
7½"
2"
2"
NO.16 GALVANIZED IRON
2¼"
2"
2"
1¼"
14"
CHASSIS DIMENSIONS

The chassis is cut as shown from No. 16 galvanized iron. The cabinet is of wood covered with leatherette material.


CUT HOLE FOR SPEAKER
12½
9½
DOOR
6¼
6¼
4½"
8¾
8"
DIMENSIONS OF PLYWOOD CABINET

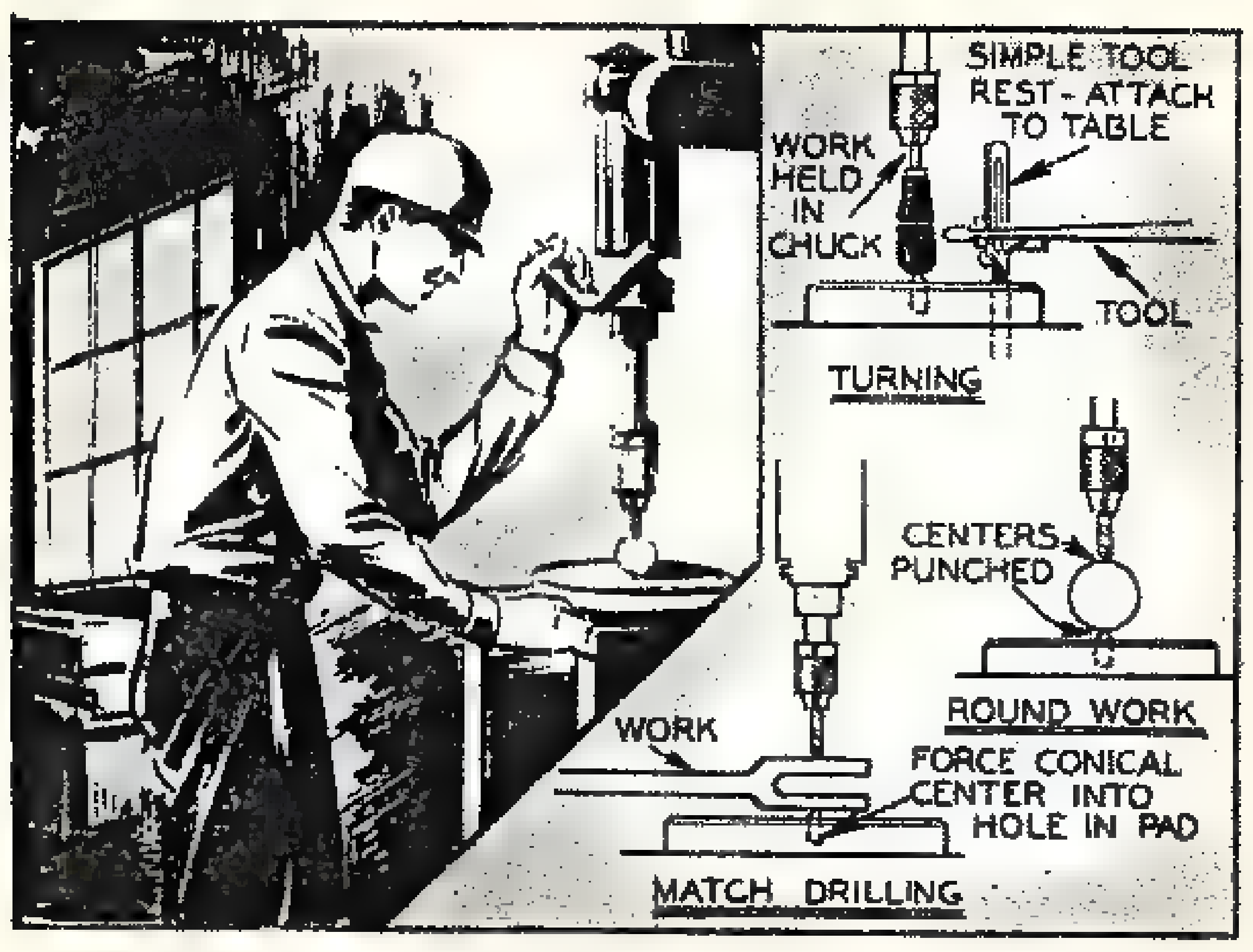


Here is the completed Master before installing in the carrying case. Although a workshop job it has all the makings of an expensive manufactured amplifier. For best sound coverage a 12-inch diameter dynamic type speaker is suggested.


NOTE:
6 VOLT LEADS CONNECT TO H-H PRONGS ON TUBE SOCKETS
FILTER CHOKE
FIELD COIL
VOICE COIL
25 MFD.
10,000 OHMS
300 OHMS
2,000 OHMS
SPEAKER
OUTPUT TRANSFORMER
POWER TRANSFORMER
6 V.
5 V.
550 V.
10 MFD.
MICROPHONE TRANSFORMER
VOICE COIL
INPUT
PUSH-PULL INPUT TRANS.
OUTPUT
PRI.
SEC.
5Z4
C.T.
ELECTROLYTIC COND.
6F5
.1 MFD.
POWER SWITCH
25 MFD.
6F6
250,000 OHMS
CAP="G"
500 OHM LINE
250 OHMS
500,000 VOLUME CONTROL
.1 MFD
10 MFD.
INDICATES GROUND TO CHASSIS
110 VOLTS
6C5
1,000 OHMS
CARBON MICROPHONE JACK
PHONOGRAPH PICKUP
CLOSED CIRCUIT JACK

No advanced radio experience is needed to build the MM Master. The above pictorial diagram shows the exact placement of all the necessary parts.

TIMELY TIPS FOR THE HOME SHOPMAN

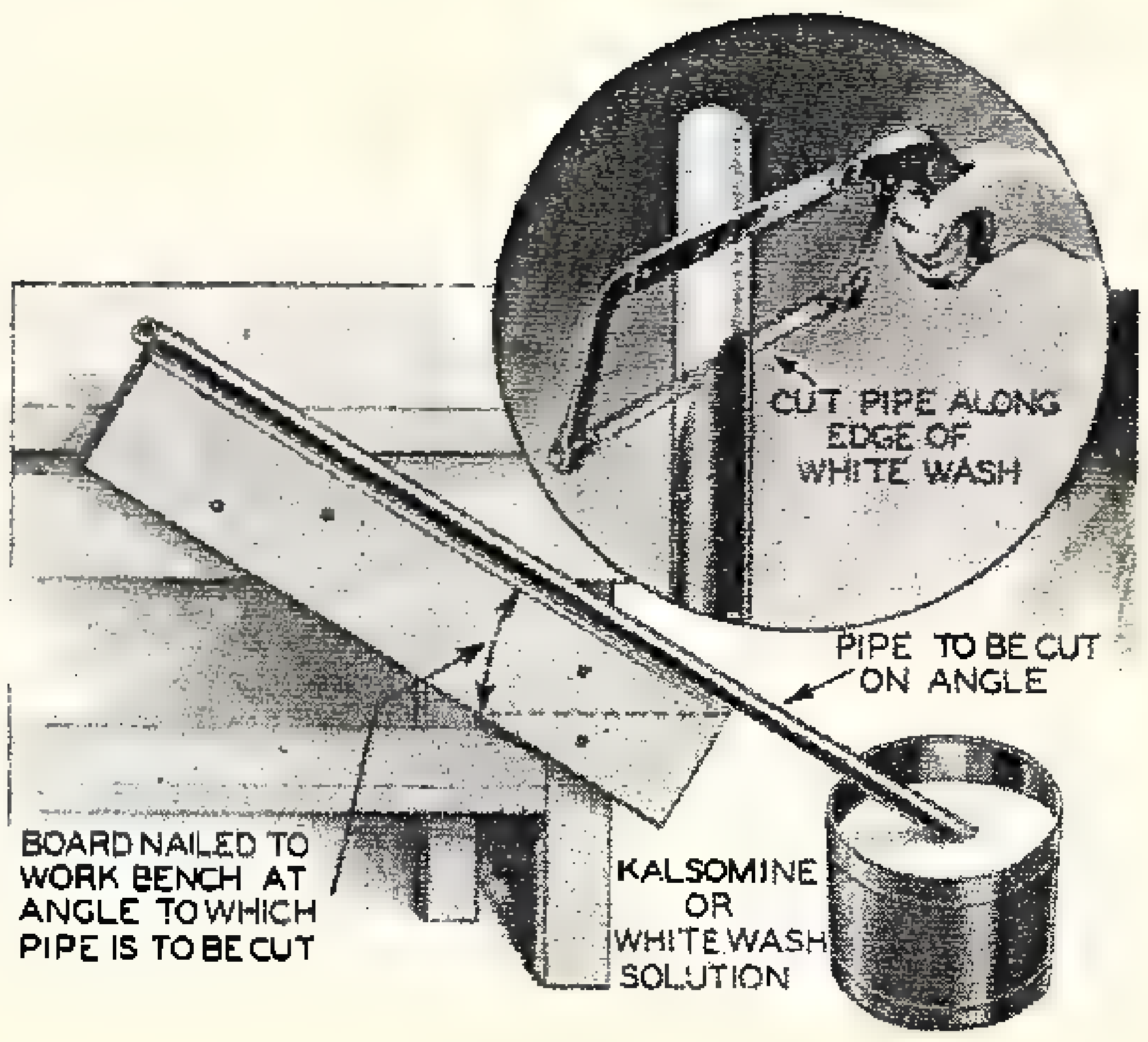

SIMPLE TOOL REST - ATTACH TO TABLE
WORK HELD IN CHUCK
TOOL
TURNING
CENTERS PUNCHED
ROUND WORK
WORK
FORCE CONICAL CENTER INTO HOLE IN PAD
MATCH DRILLING

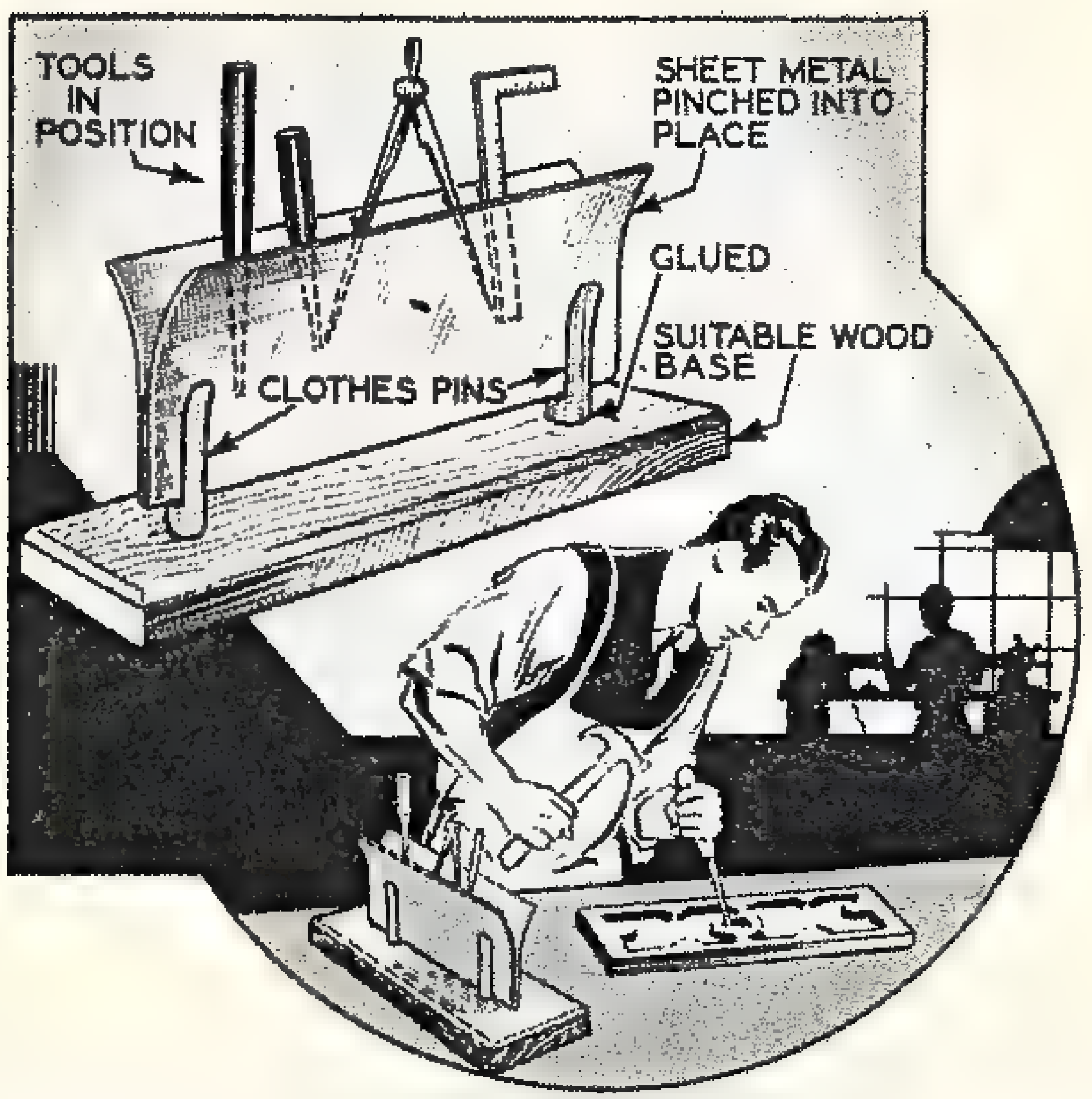
Pin Simplifies Difficult Drilling

THE difficulty of drilling through irregular shaped metal can be greatly simplified through the use of this centerpunch support. Turn down to a point a short length of steel rod having the same diameter as the hole in the drill pad. Harden the point by heating white hot and plunging into cylinder oil. When cool insert in the drill pad and place the work on the point for easy drilling.—H. Walton, New York.

Paint Line Aids In Making Angle Cuts

WHERE pipe must be cut off at an angle it is no easy task to mark it off so that a uniform cut will result. A sure way of marking an accurate "cut-off" line is to place the pipe in a container partially filled with kalsomine or white wash solution. A board nailed to the side of the workbench at the correct angle will serve as a guide in marking the pipe. When a length of pipe is to be cut mark it first with a pencil to indicate how far it should be submerged in the solution. It is then only necessary to slide the pipe down the guide to the proper depth.—J. Petr, Omaha, Nebraska.


CUT PIPE ALONG EDGE OF WHITE WASH
PIPE TO BE CUT ON ANGLE
BOARD NAILED TO WORK BENCH AT ANGLE TO WHICH PIPE IS TO BE CUT
KALSOMINE OR WHITE WASH SOLUTION


TOOLS IN POSITION
SHEET METAL PINCHED INTO PLACE
GLUED
SUITABLE WOOD BASE
CLOTHES PINS

Pinch Rack Protects Tools From Damage

IF YOU have a number of tools that are easily damaged a pinch tool support will keep them off the workbench when not in use. The support is made from a length of sheet metal bent over like a book cover and then opened at the end to receive the tools. The sheet metal clip is mounted on a wooden base drilled at each end to receive a pair of clothes pins in the manner shown. With the pinch support tools that are very often mislaid can be always kept in sight. If the builder so desires he can make supports of various sizes to meet his particular requirements. If available, spring brass may be substituted for sheet iron.—D. R. Van Horn, Lincoln, Neb.

Announcing The MM Workshop Contest Winner

HERE is the letter which won the $5 Workshop Contest prize offered in the July issue of MM. This letter, submitted by W. S. Vincent of Norfolk, Virginia, was considered by the judges as the most original. Starting with little or no capital Mr. Vincent constructed basic playground equipment and erected it on a nearby vacant lot. Charging a nominal sum easily within the reach of all parents he succeeded in inducing them to leave their children in his charge, but let his letter tell the story.

MM Workshop Editor Norfolk, Va.

Dear Sir:

With my wife's assistance I contacted the parents and suggested a plan whereby their children would not only be safe, but enjoy themselves as well during school vacation. To my surprise nearly all were willing to pay $2.50 a month for their children's safekeeping—and it was worth it. With the money advanced and my credit I was able to equip the playground with balls, bats, goal posts, teeter boards and other incidentals. Most of the large equipment was constructed in my shop at little or no expense. Today my private playground offers amusement for children of all ages—we have more than 50. W. S. Vincent.

REEL OFF THE
miles

with THRILLS GALORE!

Yes, siree! Miles of broad highways and picturesque by-paths, new sights, new beauties unfold before you, with new thrills at every turn—when you ride a 1936 Harley-Davidson. Your pulse will quicken to its fast getaway — zooming speed — high-stepping power — eye-filling style. . . You'll find extra thrills aplenty as you reel off the low-cost miles — carefree, happy miles made possible by the new speedline design and up-to-the-minute motor improvements!

See your Harley-Davidson dealer for a FREE ride — ask about his Easy Pay Plans and send in the coupon—NOW!

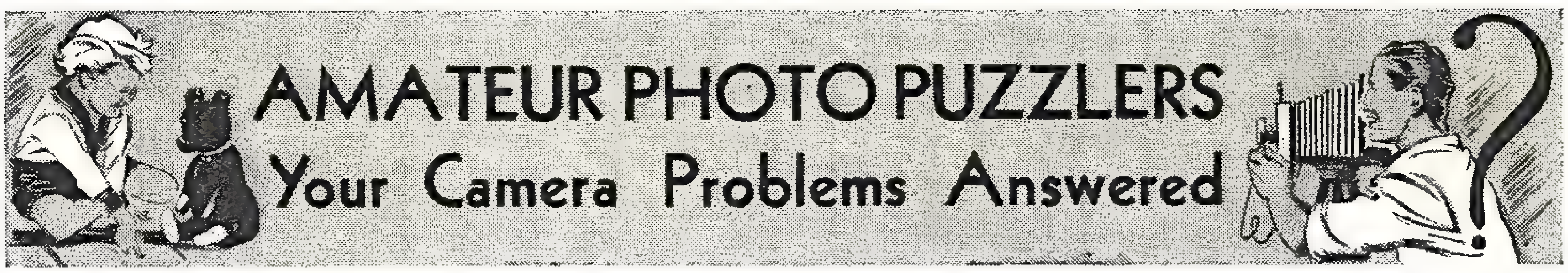
Ride a
HARLEY-DAVIDSON

HARLEY-DAVIDSON MOTOR CO.,
Dept. MM, Milwaukee, Wis.
Interested in motorcycling. Send illustrated literature. Postage stamp is enclosed to cover mailing cost.

Name..

Address...

My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up. ☐ under 16 years. Check your age group.



AMATEUR PHOTO PUZZLERS
Your Camera Problems Answered

In this department the Photography Editor will answer any question or problem related to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope in case space does not permit publication of the question and reply on this page. Send all inquiries to the Photography Editor, Modern Mechanix Hobbies & Inventions Magazine, *22 West Putnam Avenue, Greenwich,* **Connecticut.**

PROCESSING MOTION PICTURE FILM

Since my hobby is taking motion pictures I would like to reverse my own film, but am somewhat puzzled as to the apparatus required. I know that there are special solutions for doing this work, but have heard that they can also be reversed by fogging the film during the developing process. Is that correct?—R. N.

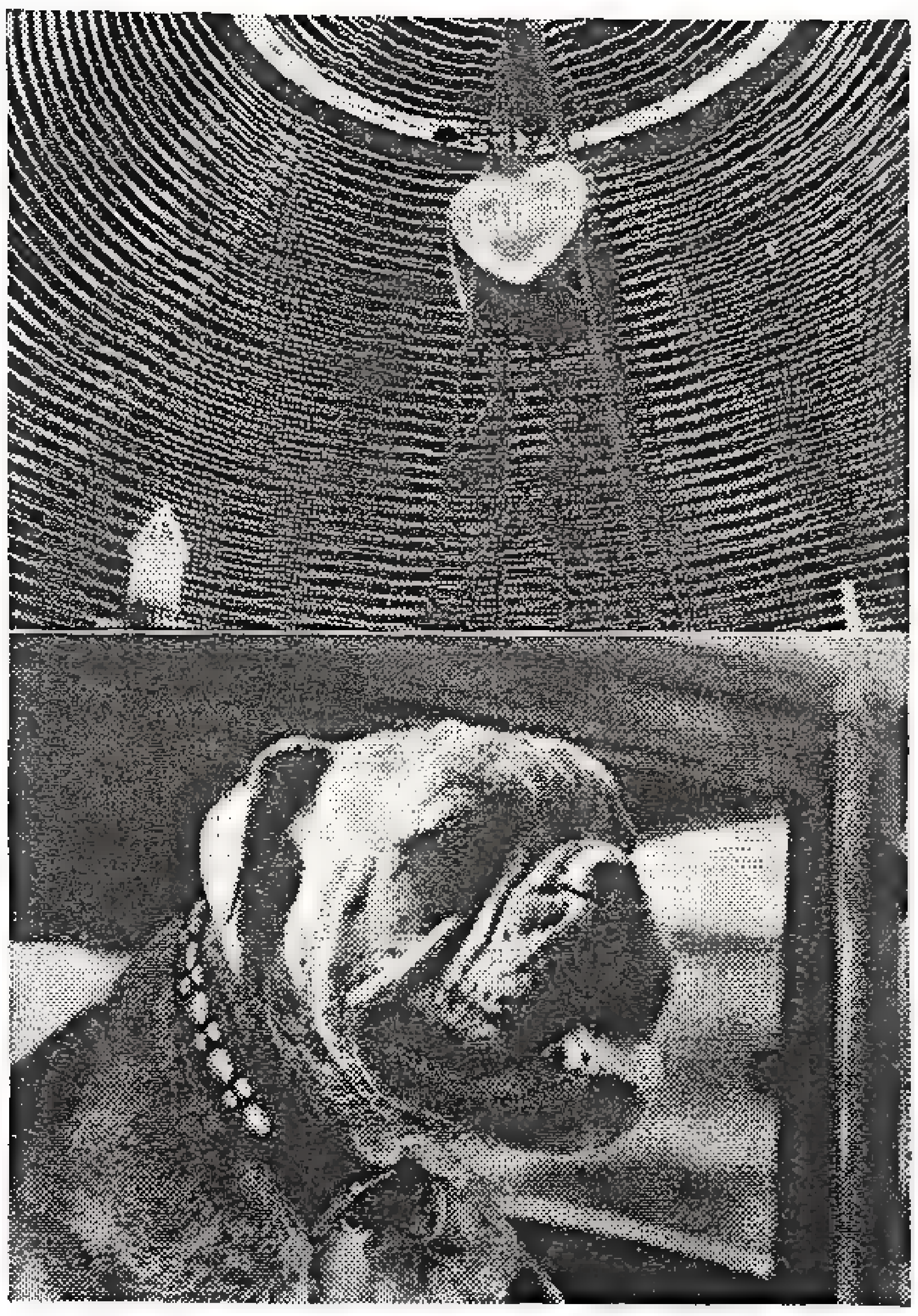
It is possible to reverse films by exposing to light after they have been partly developed but this method is very uncertain. In many instances the film will be ruined. The usual method of reversing motion picture film is to develop up the image properly and then reduce out the silver image by using a special reducer. The unexposed silver salts remaining are then exposed to a white light and the film again developed to secure a positive.

PROPER PROCEDURE FOR FILM DEVELOPING

Will you please advise the proper time film should remain in the developer solution for best results? I would also like to know the proper developing time for prints.—C. D. McG.

Many of the prepared developers will properly develop film in about five minutes when the temperature of the solution is kept at 65°F. By the darkroom tray method. The negatives should be fixed in the hypo bath for about twice the time required to clear them of the white milky appearance. Prints will develop to the proper depth in 45 seconds using the correct developer at 70°F. Follow instructions on developer package.

TWO WINNING PHOTOS



The top picture shows what happens when a circle swing is photographed at night. This picture taken with a 2 sec. exposure and f:4.5 stop won $5 for Paul Strisik of Brooklyn, N. Y. This month's 2nd prize of $3 to J. P. Knipp, Long Beach, Calif., for his dog photo.

CAUSE FOR FILMS TO FOG

Recently I have experienced disappointing results with my home developing work. For some reason the film after being developed was very badly fogged. Until now my work has been satisfactory. Can you suggest a possible cause for the trouble?—R. J. K.

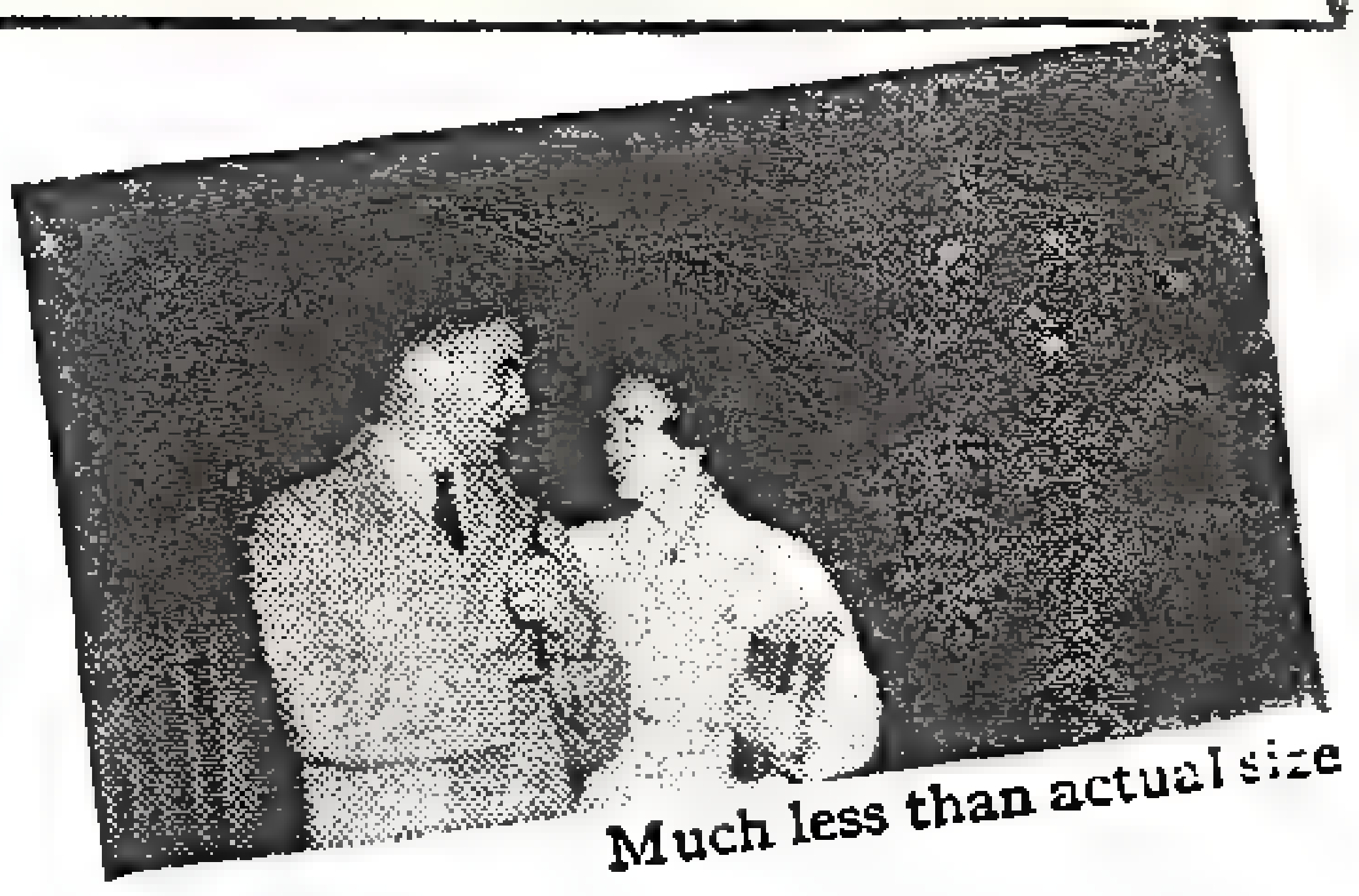
The trouble about which you inquire was no doubt caused by an unsafe light in the dark-room during the developing process. When developing panchromatic film it is advisable to work with no light at all. On fogged negatives and those which are very flat a printing paper with a very good contrast should be used. The printing exposure should be limited to 45 seconds. If the print when developed shows up too dark the exposure should be made less than 45 seconds. The developing solution should be kept at 70°F. for best results.

TAKING PICTURES WITH COLOR FILTERS

How can I take snapshots so as to have them appear that they were taken on a moonlight night?—L. O. V.

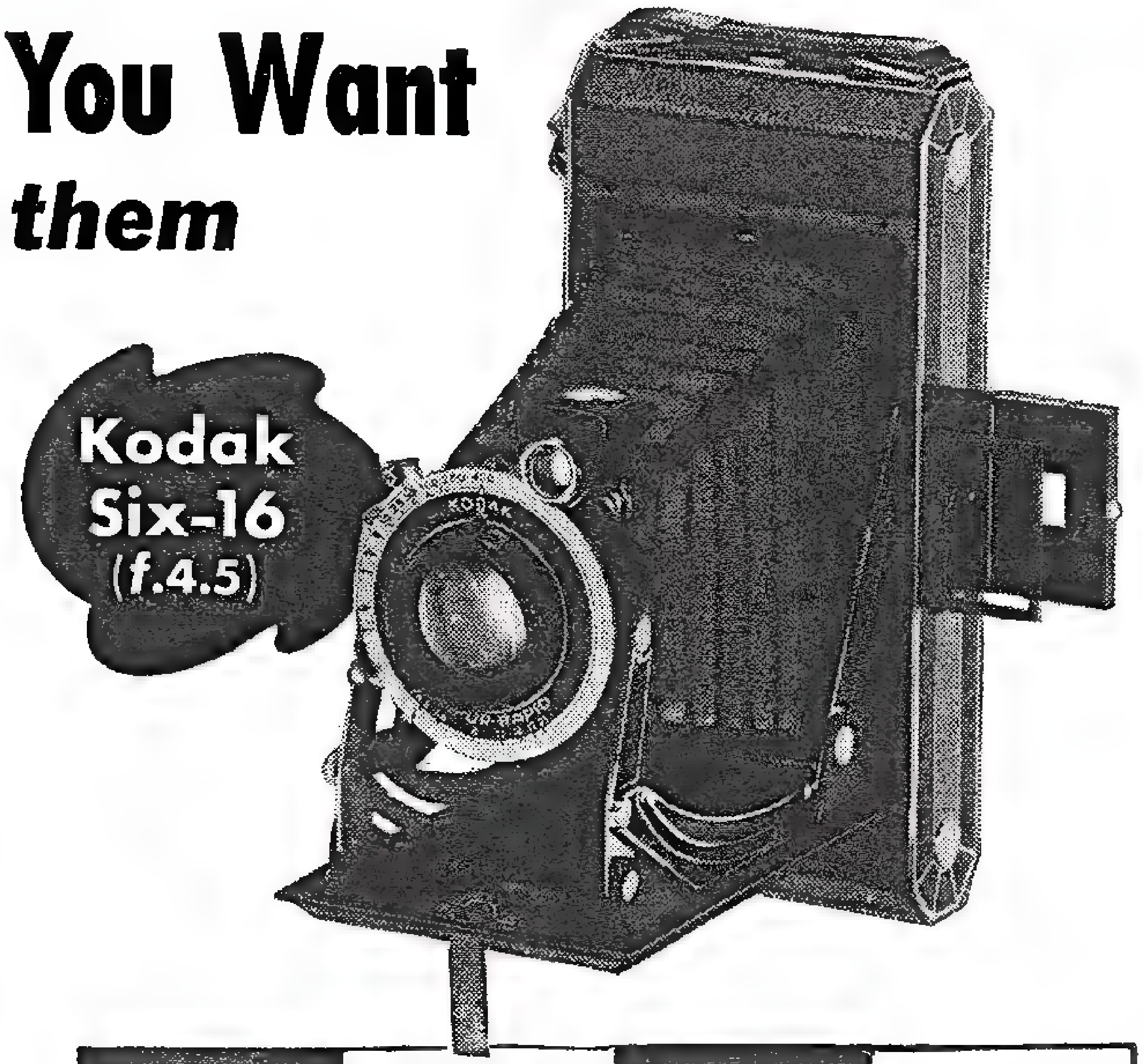
A simple filter of dark yellow cellophane placed over the lens of your camera will make photos taken just around sunset appear to have been taken in the moonlight.

FAST ACTION | **INDOORS AT NIGHT** | **EVEN IN THE RAIN**



Much less than actual size

For the Pictures You Want
—*when you want them*



THE big fun of picture making is in having a camera that doesn't need time off. Kodak Six-16 (*f*.4.5) lets you master every snapshot opportunity.

Every hour of the day or night is picture-making time with this modern Kodak. No matter when or where snapshot opportunities arise, you're set with Kodak Six-16.

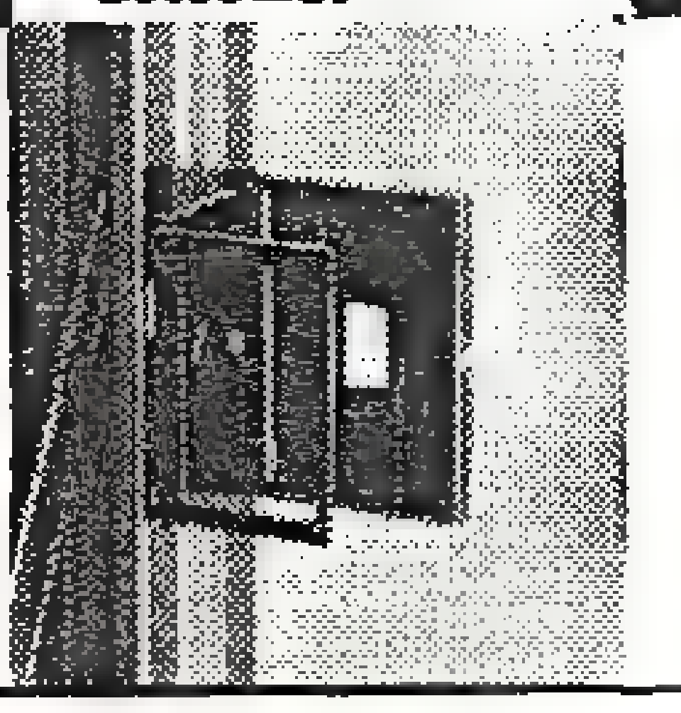
Action shots . . . scenes . . . close-ups . . . even indoor snapshots at night, with Kodak "SS" Film and Mazda Photoflood bulbs, are easily within range of this Kodak. Take the restrictions off your snapshot making . . . ask your dealer to show you this all-round, fine Kodak.

FEATURES: 1/400-second Compur-Rapid shutter with delayed-action timer, Kodak Anastigmat *f*.4.5 lens, eye-level finder. Makes 2½ x 4¼-inch pictures, costs $40.

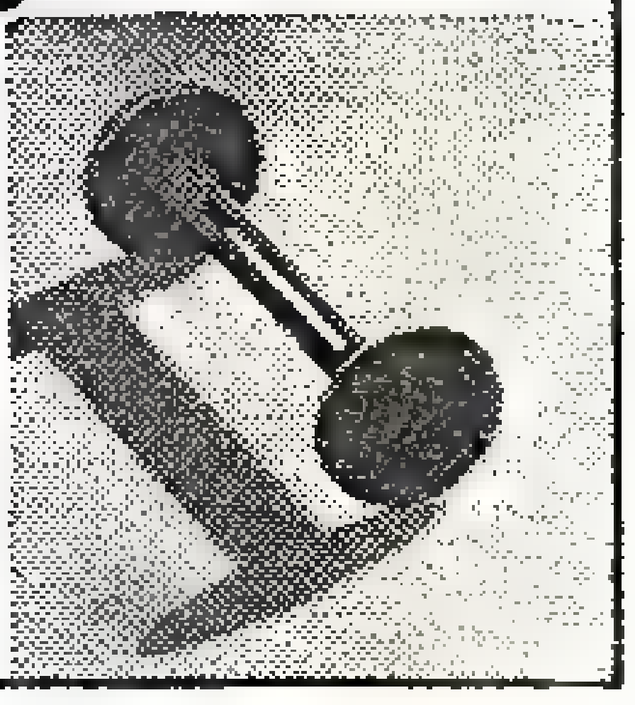
The 4-section lens is a photographic jewel . . . a high-quality, high-speed anastigmat that "makes good" under difficult conditions.

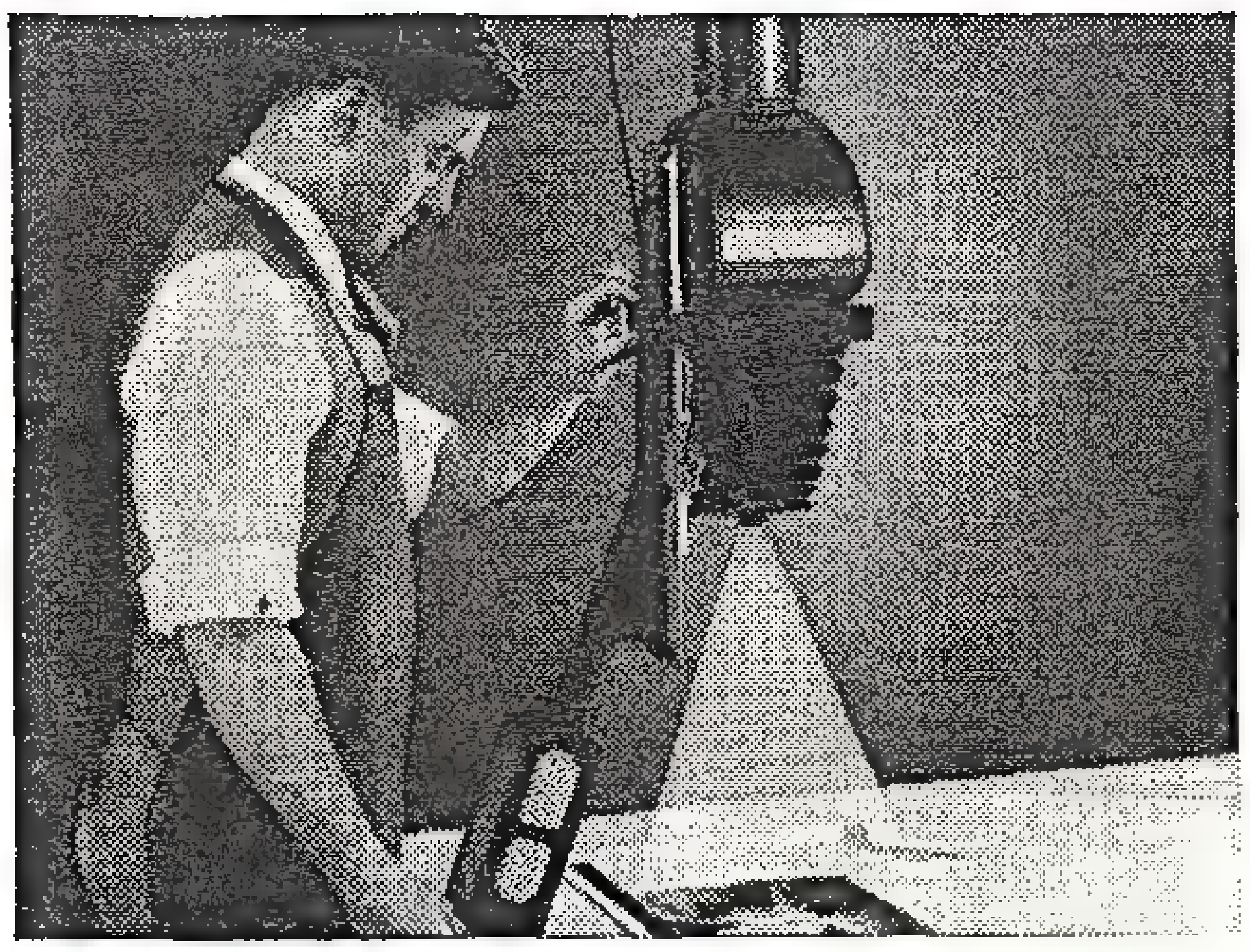
The Compur-Rapid shutter has nine speeds, from 1 to 1/400 second. Delayed-action timer lets you get in the picture yourself.

The eye-level finder frames the picture accurately in following fast action. When not in use folds flat against camera.



Metal spools make Kodak Six-16 the smallest roll-film camera for its picture size. No bulky wooden spools take valuable room.





KODAK AUTO-FOCUS ENLARGER, MODEL B. The ideal enlarger for home darkrooms—takes negatives up to 4x6 inches, is adaptable to film or plate negatives, enlarges from 1½ to 3½ diameters. Complete with lens, Photoflood lamp, paper holder, table clamp and set of seven flexible metal masks. Price, $40.

KODAK CATALOG

Write today for your copy of the small Kodak catalog, 1936 edition, or get it at your dealer's . . . Eastman Kodak Co., Rochester, N. Y.

Name______________________________
Address____________________________
City________________State_________

M. M. 9-36

STAMPS WORTH MANY TIMES WEIGHT IN GOLD

A LITTLE more than 63 years ago a British lad while looking through a package of old letters came across a one-cent British Guiana stamp which was unlike any he had ever seen before. The small magenta colored stamp, when shown to a local collector, brought the youth three dollars. Shortly after, the collector sold the same stamp to another dealer for a higher price. This collector held the stamp for ten years and when he finally sold it he received about $125. During the next 52 years the stamp passed from one collector to another until the late Arthur Hind of New York purchased it in 1921, for the unheard of sum of approximately $36,000. When Mr. Hind died, the stamp was placed on sale in London, but only after armed guards were posted around the display cabinet as shown in the photo. The stamps at right are equally as rare as the New Guiana issue.

BARBADOS
POSTAGE

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Macao, Iraq, Charkhari, French and British Colonies, including natives, beasts, ships, etc., all for 5c to approval applicants. Big illustrated lists included. Kent Stamp Company, Box 87Z (G. P. O.), Brooklyn, N. Y.

50 DIFFERENT Stamps cataloging over $1.00 only a dime to approval applicants. 20,000 different stamps at prices ranging from 1c. All stamps guaranteed genuine. A fine selection of U. S. revenues at 1c and up. Address F. G. Stein, Dept. 214, 7360 N. Seeley Ave., Chicago.

JUGOSLAVIA TWO SETS COMPLETE; Dominican Republic, two beautiful sets; Sweden, 1920 complete; Ten Hungary Heads; 23 different Soviet Russia. 66 stamps cataloging $2.33 only 25c. Friendly Filatelists, 3615 N. Sydenham, Philadelphia, Penn.

FREE! New illustrated 56-page catalog "United States, British Colonies and Foreign Stamps"—at real money-saving prices. Includes details of amazing Free Stamp Offer. Send postcard for copy. H. E. Harris & Co., 156 Transit Building, Boston, Mass.

BRITISH TURKISLANDS—Also Congo's—Montecarlo—Nigercoast—Uganda—Djibouti—Ecuadorian—Ivorycoast—Ubangi—Countries collectors need. Free for 5c postage. EMPIRE STAMP SHOP, Dept. MM., TORONTO, CANADA.

STAMPS! 100 diff. 3c; 500 diff. 35c; 1,000 diff. 90c! Illustrated Album (4000 spaces) 22c. Approvals sent. Tatham Stamp Co. (D9) Springfield, Mass.

FREE! Rare Siberia, Far Eastern Republic valued 35c, Levant Set, interesting Soviet Packet—Approvals included. "Saxon" Albee Bldg., Brooklyn, N. Y.

AIRMAILS—60 Specially Picked, including triangle and Zeppelin, only $1.00. Eisenmeier, 3700 Frankford, Baltimore, Maryland.

MONTHLY Stamp Magazine one year and 25 foreign stamps. 25c. American Stamp Journal, Cedar Rapids, Iowa.

10 UNUSUAL U. S. Revenues, only 5c to approval applicents. Crane Stamp Co., 901 Bedford Bldg., Chicago, Ill.

FREE!!! King George Memorial Packet, 15 varieties. Postage 3c. Roberts, 901-T Fourth, Baycity, Michigan.

UNITED STATES—Elaborate Pricelist free. 45 different 10c. 75 different 30c. Seidenberg, Baroda, Mich.

STAMPS sent on approval. Quality at low prices. Fred Herzberg, MM 197, Grantley, Elmhurst, Ill.

COINS

$5000.00 EACH for Rare Coins. We guarantee to pay the World's Highest Prices. Old Cents up to $2000.00 each, 1860 Cent $50.00. Cents of 1861, 1869, 1870, 1881, 1890 $20.00 each, 1859, 1866 to 1875, 1909 $10.00 each, 25c before 1916 $300.00, 50c before 1916 $750.00, Lincoln Cents before 1932 $35.00 per 100. Paper Money $26.00, Foreign Coins, Half Cents, Half Dimes and thousands of others up to $2500.00 each. Send Dime for Large Illustrated List before sending coins. Romanocoinshop, Dept. 560, Springfield, Mass.

$5.00 TO $500.00 EACH paid for Old Coins. Keep all old money. Get posted. Send 10 cents for Illustrated Coin Value Book, 4x6. Guaranteed Buying and Selling Prices. Coin Exchange, Box 17, Le Roy, N. Y.

COMMEMORATIVE $½s. Lincoln, Texas, San Diego, Oregon, $1.50 each. Illustrated Catalogue 25c. Norman Shultz, Salt Lake, Utah.

FREE: Foreign Coin, Banknote and Large Illustrated coin catalogue, for 4c postage. Approvals sent. Tatham Coinco, Springfield-9, Mass.

OLD MONEY Wanted. $5.00 to $2,500.00 each paid for old coins. Buying catalog 10c. Robert Cohen, Box 483, Muskogee, Okla.

COINS, Beadwork, Indian Relics, Minerals, Books, Curios, Stamps. Catalogue, 5c. Indian Museum, Northbranch, Kansas.

INDIAN CURIOS

16 ARROWHEADS, Spearhead, Scalpingknife, Gempoint $0.99—120,000 Bargains—Firearms—Photolist 10c. Paul Heikes, Rutland, Illinois.

15 GOOD Indian Arrowheads 50c. Tomahawk head 50c, Catalog 3c. H. Daniel, Dardanelle, Arkansas.

5 HOURS *and* 44 MINUTES

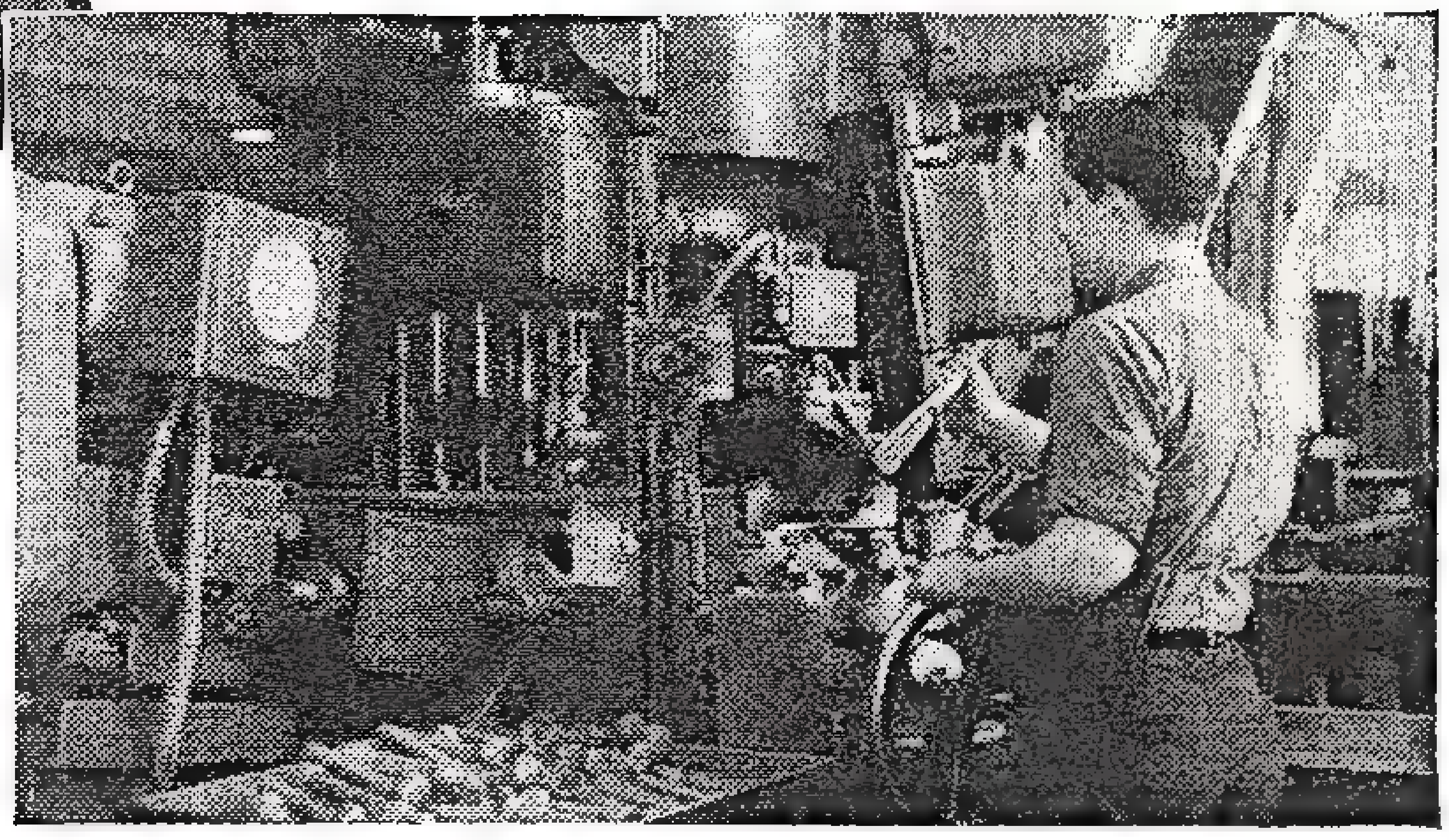
TO MAKE ONE FORD SPINDLE BOLT!

Forging spindle bolt heads.

FOLLOW a Ford spindle bolt through the various operations of its manufacture and you will spend the better part of a full working day. From the time a piece of rough stock is sheared from a bar until the finished spindle bolt is produced, you will see 33 different operations that will take 5 hours and 44 minutes to complete. You will be impressed by the care and precision used in the various forging, machining, grinding and inspection operations.

And when that spindle bolt is finished it will be the best spindle bolt that men, money, machines and experience can make.

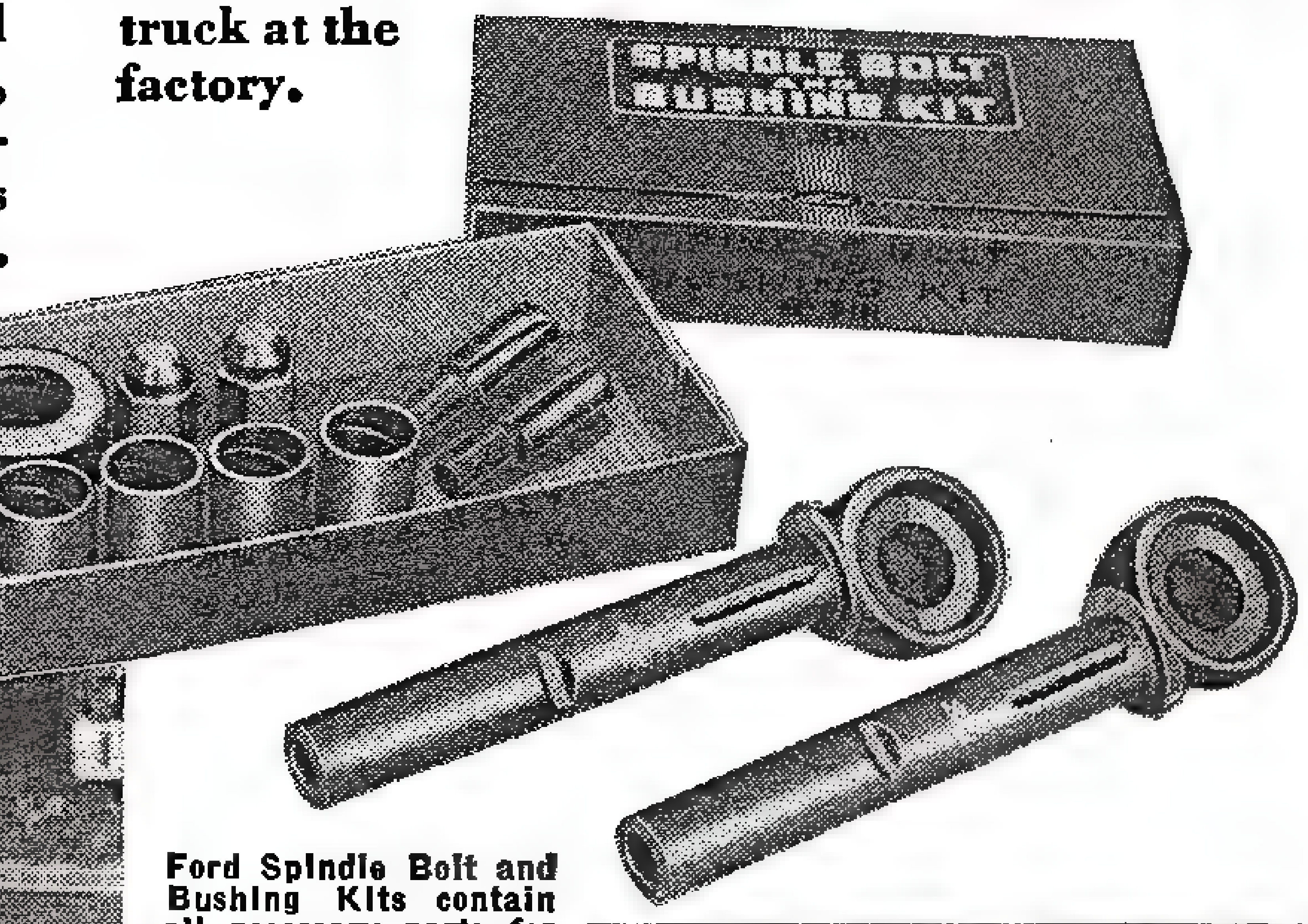
The care taken and the precision used in the manufacture of Ford spindle bolts are typical of that used in the making of all Genuine Ford Parts. Quality materials, expert workmanship, precision machines, careful inspections are important in the making of a vital part such as the spindle upon which your safety depends.



This huge, semi-automatic machine with rotating table performs six machining operations simultaneously.

It pays always to demand Genuine Ford Parts!

When replacement parts are needed, you can maintain with Genuine Ford Parts the same high standards of quality and performance that were built into your Ford car or your Ford truck at the factory.



Ford Spindle Bolt and Bushing Kits contain all necessary parts for completely rebushing the spindles. Included are spindle bolts, bushings, thrust bearings, locking pins, nuts, felt washers and retainers. Complete kit costs less than when parts are purchased separately.

Inspecting spindle bolt diameter on visual indicator which has 1000 to 1 magnification—1/1000 inch looks like 1 inch on scale.

Heat-treated spindle bolt forgings from continuous type electric furnace.

GENUINE Ford PARTS

FORD MOTOR COMPANY, DEARBORN, MICH.

3 IN
3 IN
3-IN-ONE OIL

NEW LIFE FOR LIGHT MOTORS, AUTOS, HINGES, ACTION POINT OF TOOLS, LOCKS, ETC.

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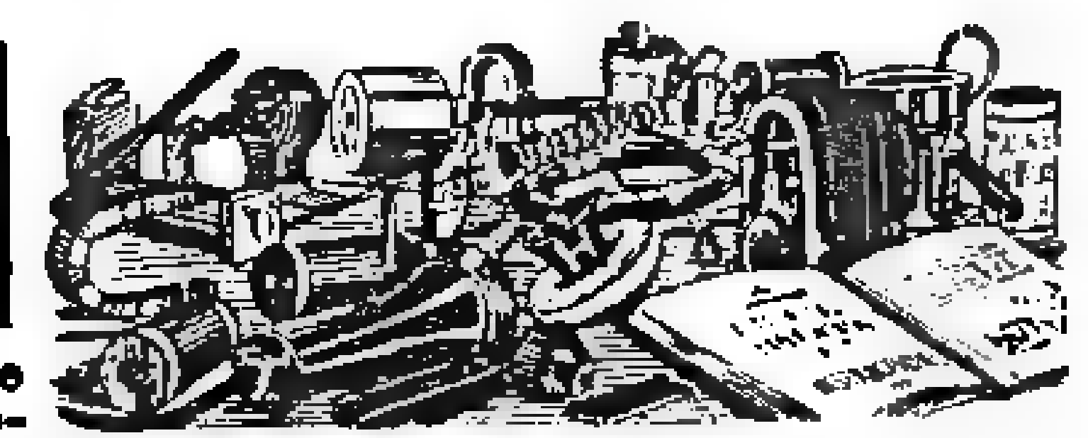

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A Midget Foot-Powered Locomotive

[*Continued from page* 101]

as indicated in the diagrams so that a realistic effect is produced.

The locomotive proper is completed by installing such extras as running boards, end ladders and boiler fittings. The safety valve can be duplicated by installing a small tin can on the boiler just behind the steam dome. The steam dome is a tin bucket which has been hammered out on the bottom so as to form a curved surface. A short length of pipe plus an elbow will do nicely as a dummy safety valve. A bell may be picked up in any 10-cent store and mounted on a suitable strap iron bracket.

A drum and cable system is employed to steer the locomotive. The steering wheel can be cut from several thicknesses of plywood or a wheel from a discarded pushmobile may be used. Power is supplied to the locomotive either by an auto car motor geared up to the drive wheels or through the use of an axle provided with double crank throws. This is clearly defined in the diagrams.

The tender is built up from an express wagon frame, therefore little explanation is required. To complete the locomotive paint the roof of the cab and the wheels red, the frame, boiler and firebox black and the cab and tender in green. The name of your favorite railroad may be painted on the tender in gold bronze. If desired an auto starter motor powered by several storage batteries connected in parallel may be used to power the train. A satisfactory gear or chain drive will of course be required between the motor and axle. It should be noted here that only one rear wheel is connected to this axle. The other remains free so as to prevent the locomotive from skidding when taking corners.

By following the diagrams any shopman or boy should have no trouble in producing a train equal or superior to this one. It is surprising what a few extra attachments such as dummy gauges and electric headlight will make. Careful construction will result in an unusual toy of which you can well be proud.

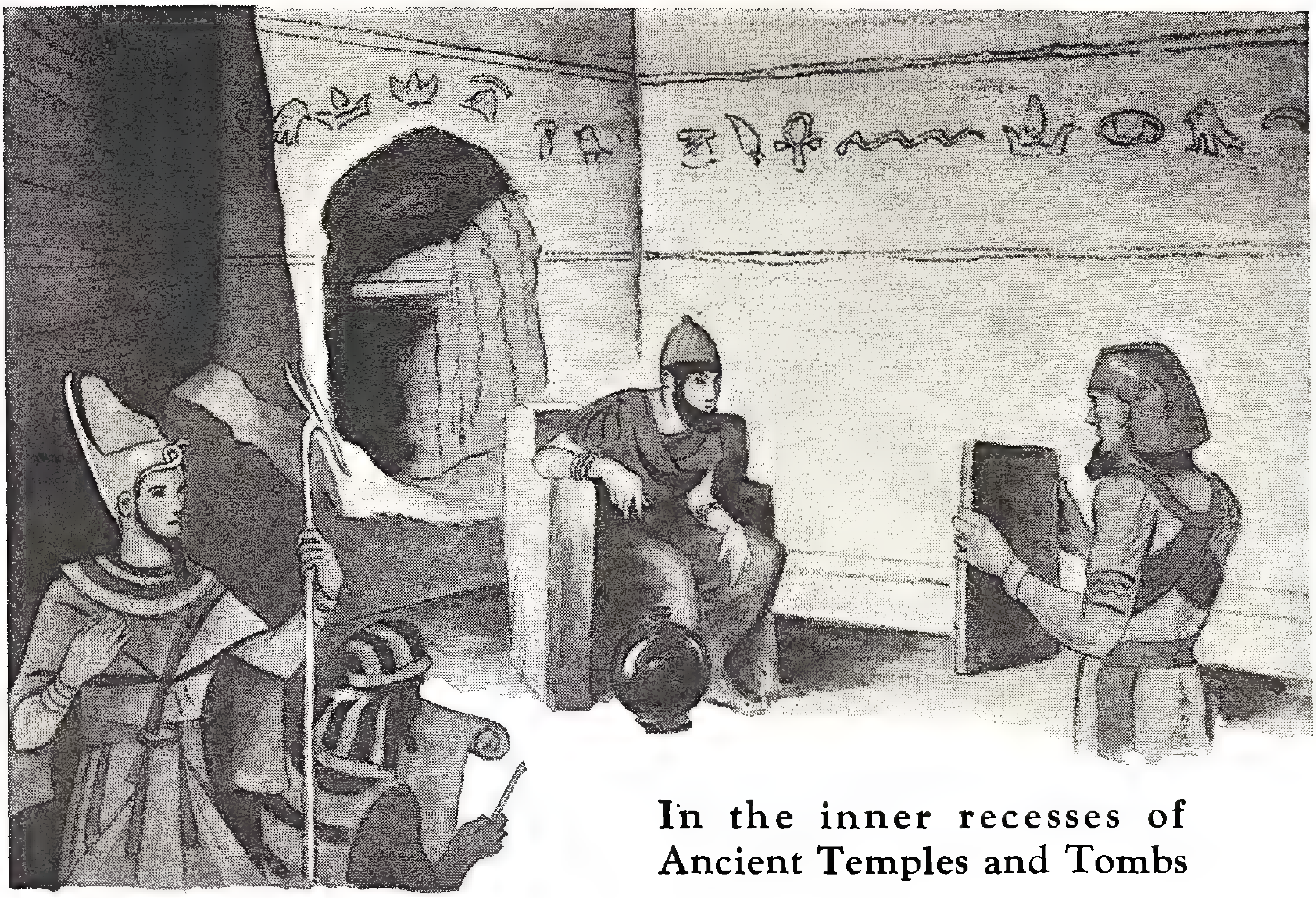
A Lead Plate Bud Vase

[*Continued from page* 110]

rication, rub the lead until it fits the wood tightly. The upright is plated with sheet lead in the same manner as the base. It will be best to touch the seam occasionally with solder, first taking out all slack with the maple stick. Last, solder the seam solid, cut and true with the chisel then solder a small lead disc to the top to complete the lead sheath.

Bore the hole in the base center for the tenon, coat this with best quality liquid glue and assemble. Place the vase between the lathe centers and turn up the tail stock to make the joint tight.

Complete the vase by boring a half-inch hole in the top, deep enough to take a test tube. For the final finish, place the vase in the lathe and rub lightly with No. OO steel wool. Flow on clear lacquer with a brush and after it has dried, touch lightly with the finest steel wool to produce a nice luster. A piece of felt glued to the bottom will prevent the vase from marring furniture.



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The Pre-Fabricated House Arrives

[*Continued from page* 73]

customer, at an extra cost of $250 for the change.

A similar system is employed by General Houses, Inc., of Chicago, which estimates the yearly upkeep cost of one of its homes at $50. Interior steel walls may seem a radical departure, but they can be finished in a variety of methods —either by painting, or by the patented method developed by one company in which actual photographic enlargements of wood graining or other effects are mounted on the metal and become a permanent part of it.

The use of concrete for house walls is not new, but some of the recent advances are arresting. As long as twenty years ago Thomas A. Edison built a series of experimental concrete houses. He sawed out wooden molds in quantity in a factory, set them up and poured the walls.

Pre-cast concrete panels are also important in the pre-fabrication picture. The Earley Process Corporation of Washington, D. C., is casting reinforced concrete panels in slabs two inches thick, room height, and varying from two to ten feet in width.

One of the most inexpensive pre-fabricated houses is offered by the Steelox Company of Chicago, which will sell you two bedrooms, living room, kitchen, bath and storage room for $1,050, and for an additional $300 will provide window shades, kitchen equipment, plumbing and electric fixtures.

Wood has not by any means been completely discarded, but its use is greatly modified by modern methods. The United States Forest Products Laboratories at the University of Wisconsin in Madison, Wisconsin, has developed pre-fabricated plywood panels only 1⅜ inches in thickness from which a house can be entirely constructed without use of a frame.

Pre-fabrication in wood has enjoyed considerable vogue for some time. Forty years ago a young man named Ernest F. Hodgson began the manufacture of pre-fabricated wooden panels for the construction of cottages and garages. For $393 his company will deliver a two-room cottage with side porch, and for $1,400 a double-wall cottage with living room, bedroom, kitchen and bath.

Strongly appealing to the imagination is the plastic house molded from resins such as form the basis of pipestems and buttons. Such houses are not yet commercially available, but a demonstration home has been built to prove the obvious advantages of this novel material. The plastic is called Vinylite, and in its natural state is so transparent that it can be used as window glass.

Another ingenious pre-fabricated house makes use of airplane principles. This is the cotton house designed by Stanley Nicholson of Milwaukee. A wood frame is employed and over it is stretched cotton sheeting which is given a coating

[*Continued on page* 129]

Graham McNamee

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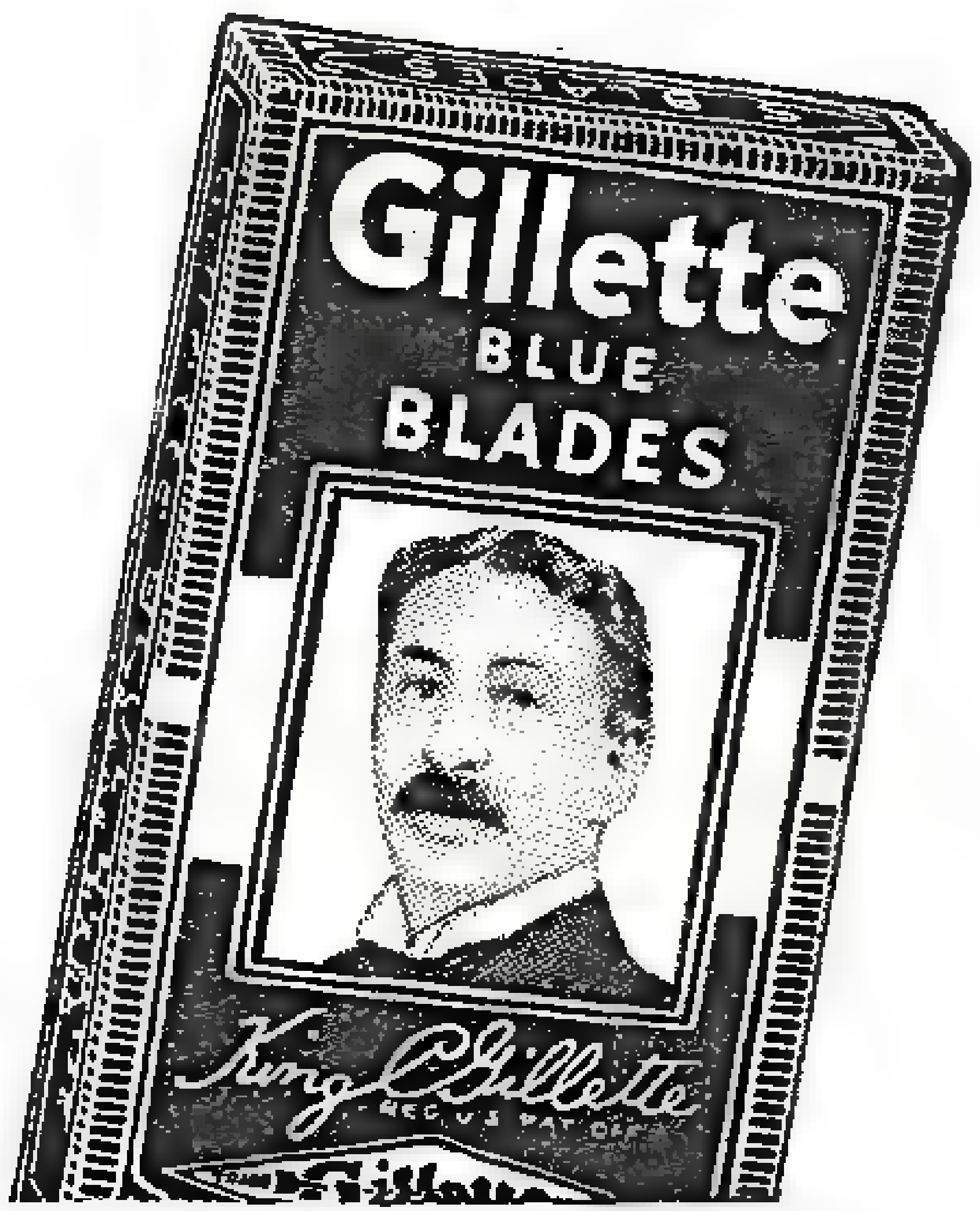

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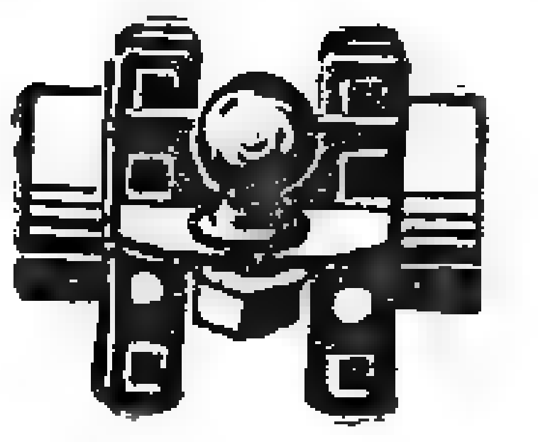

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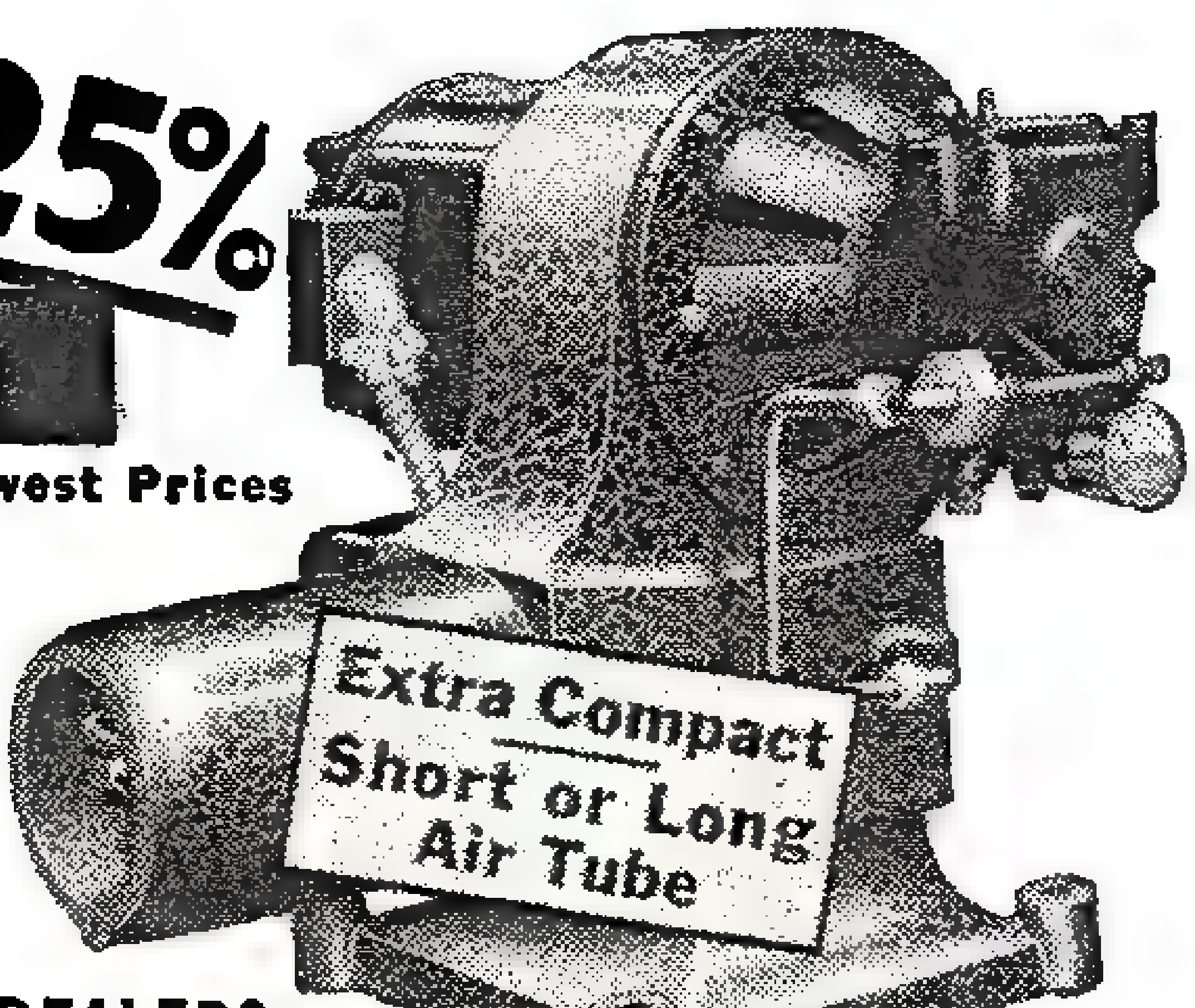

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Inlaying With Colored Sealing Wax

[*Continued from page* 98]

carefully to see that no lines have been left uncut and formed into channels, strip off the tracing paper, sponging it with warm water where it sticks. This done, enlarge the outline with a small gouge so inlays may be run in.

The next step is that of actually running the shellac into the cuts. Fit the soldering iron with a small size tip and heat slightly. Mahogany shellac was used for all cuts except the birds' claws and part of the eyes, the white used only for the high lights in the eyes.

Melt the proper color of shellac in small quantities directly into the channels until filled, wiping off with a clean rag after each color has been inlayed.

Coloring the picture is the next step. The water colors are applied to the wood with care to prevent an overflow of coloring beyond the shellac filled outline.

After coloring has been completed, the project is ready to receive a surface finish. A solution of 1 part white liquid shellac to 7 parts wood alcohol, used for the first coat, is brushed on with quick light strokes, and left to dry thoroughly. The second and finishing coat of a 1 to 1 solution shellac in wood alcohol is then applied. When this has dried rub down with fine steel wool and apply furniture wax.

"MM Metal Tube Master"

[*Continued from page* 113]

Any power transformer having a six, five and high voltage winding between 450 and 600 volts may be used with the amplifier. The speaker output transformer should include an extra 500 ohm winding so that additional speakers may be added if desired. The amplifier should be wired up according to the pictorial diagram. Leads should be connected only to the tube socket prongs indicated with the other prongs remaining blank. A 500,000 ohm potentiometer serves as the volume control and is located on the rear of the chassis. The 300 ohm slide resistance is adjusted for best results. Jacks permit either a phonograph pickup or carbon microphone to be used with the unit.

A wooden container large enough to house the amplifier, and covered with black leatherette, completes the work. An opening in the front serves as the baffle board for the speaker.

Resistances, except for the 10,000 and 300 ohm sizes, are of the 1-watt carbon type. All condensers, except for the electrolytic 8-8 mfd., are cartridge types and of the highest voltage rating available for the particular sizes used.

No external batteries are required for the microphone since it takes all of its power directly from the amplifier. When constructed according to the diagrams, the outfit will deliver sufficient volume to fill an auditorium seating 1,000 people.

183 Share $1,000 In Prizes!

[*Continued from page* 35]

Omaha, Neb.; Eldon Frye, Bartlesville, Okla.; Nathaniel Smolen, Bronx, N. Y. C.; C. D. Kitchen, Jr., Atlanta, Ga.; Roland J. Sigafoo, Bridgeton, N. J.; Edward C. Gilmore, Holly Hill, S. C.

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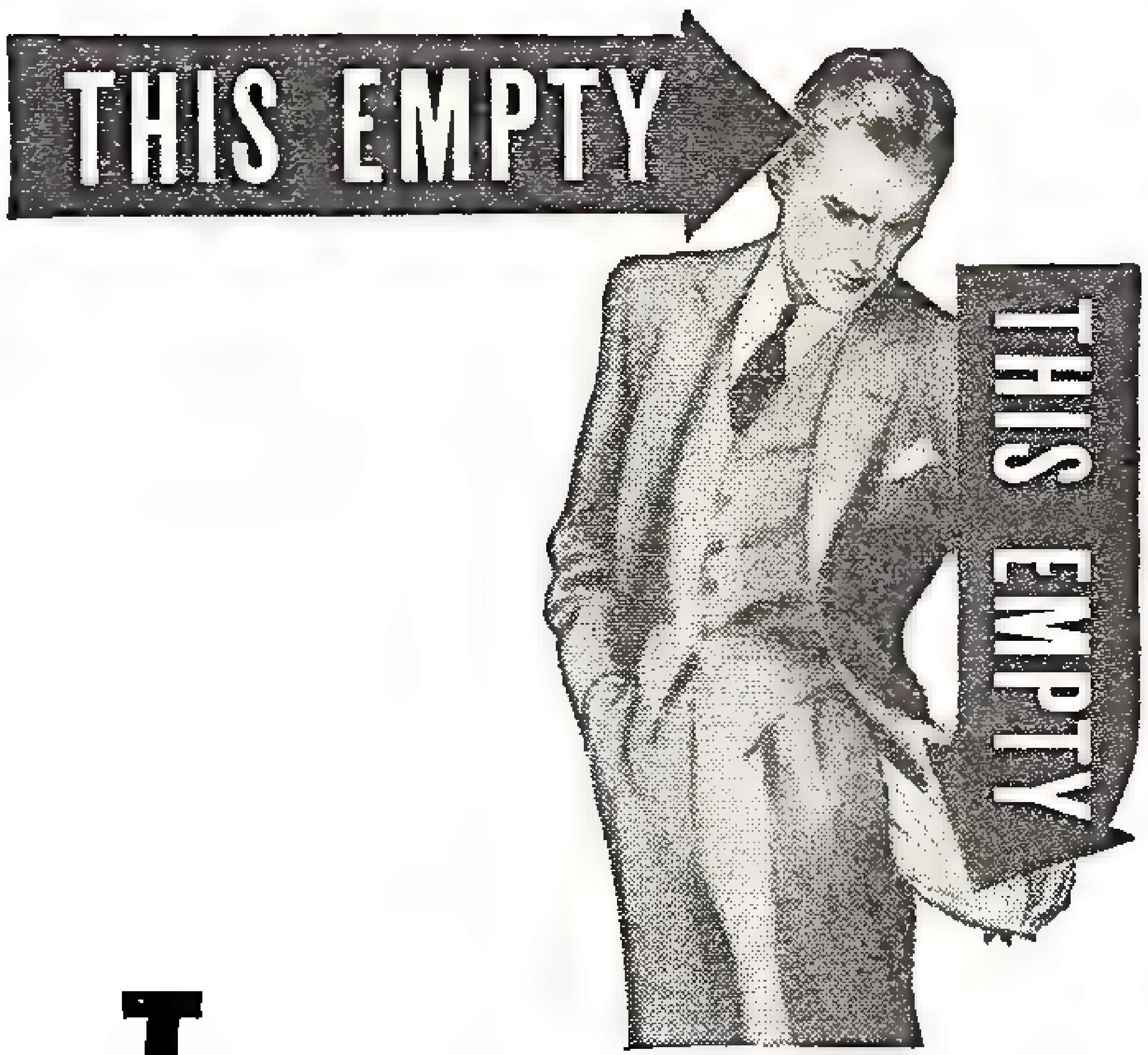

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Checking Car For Engine Noises

[*Continued from page* 93]

ing sections are next bolted rigidly together so that the vibration of the motor will not cause them to come loose.

It is very important that each cylinder receives its proper quota of vapor so that all pistons will be forced down with a uniform explosion. In order to insure this all valves must be provided with springs of uniform tension. One spring being weaker than the others will result in the motor vibrating excessively. To prevent this, the tension of all valve springs should be tested by compressing with a spring balance installed to a jig similar to the one illustrated in the diagrams. When replacing a spring that has been broken be sure that it is of the same tension as the others. The nut on the valve stem is adjusted until the proper tension is secured.

If valves hiss there is an escape of vapor through the valve guide. To overcome this place a tight fitting felt washer over the guide with a light spring being placed over the stem to hold the washer down. The sealing is completed by packing the counter bore with asbestos-graphite packing.

Even though your car burns high test carbon free fuel it is advisable to clean the carbon deposits from the valves and pistons after each 50,000 miles of driving. If ordinary gasoline is used the valve grinding and carbon cleaning should be attended to sooner. Doing this at the proper time will save you many dollars later on if left go.

The last of the many elusive automobile noises is that one caused by grease and dirt entering the housing containing the tork spring and gear. Usually the oil is thrown off by the flywheel while the dirt adheres to the mechanism just as soon as oil is present. To eliminate the tork spring going erratic a small hole is drilled in the top of the housing and plain gasoline squirted into the mechanism. The gas will dissolve the oil and eliminate sudden breaking of starter springs.

From the explanation given here it is clear to see that even the most involved automotive troubles can be remedied by the average person if the work is performed in a systematic manner.

Auto Triumphs Feature Centennial

[*Continued from page* 61]

A notable system of electric lighting and an array of man-made lakes feature the Centennial grounds. A detail of Texas Rangers and the "Rangerettes" add color to the scene. The latter are young women in western garb who are official hostesses and information dispensers.

The National Cash Register Exhibit is a giant cash register which rings up the attendance as crowds flock through the turnstiles. Attendance during the first week was 426,625 and officials expect 10,000,000 visitors before closing.

Stunting On A Motorcycle

[*Continued from page* 57]

Another stunt is one in which the rider leans backward, extends his feet into the air and lets his head hang down over the back wheel. Still another is to place both legs to the right side of the machine, stand on the foot rest with the left foot and grip the handlebars with the left hand. The right side is preferred because the grip on the handlebar gives the stunter control of the throttle and he slows the machine as desired. The right hand and foot are stretched outward.

There are kneeling stunts, such as riding with both knees on the seat with arms outflung, and riding the seat with one knee with one leg out.

Stunts become more complicated when the rider has a partner. One of the popular double person tricks is one in which the rider takes a position on the seat with one foot and grips the handlebar with one hand, having the other hand and foot flung outward. His partner, generally a woman, takes a sitting position on the front wheel mudguard, braces her feet on the foot plates, and leans backward, with her arms outflung, and her head almost touching the spinning wheel.

Another trick is for the woman to climb to the top of the rider's shoulders and take either a sitting or standing position, with her arms stretched upward. After she gets her position the rider rises into upright sitting position, letting go of the handlebars.

The partner stunt which is breath-taking is the "human leap." A sturdy board, one which will stand the weight of the machine and rider, is fastened on an obstruction which rises one end from the ground several inches. The partner then lies down on the side opposite from which the board extends. The rider takes the cycle at a fast speed up the board and jumps entirely over the woman.

Ladder Climbing Tops Stunt List

One stunt people will hardly believe is possible is ladder climbing atop a fast moving machine. A ladder, some made of wood and others of metal are used for this stunt. These ladders are fastened by various means, according to the riders choice, in back of the seat. The cycle is speeded to about a 35-mile gate. The rider either climbs the ladder backward or turns around and goes up frontward, crosses the top and climbs down the other side. He repeats the process, back to the seat again. The ladder is six feet high to the top round. A quiet day must be had for this trick. Wind might mean disaster.

Riders who are good at climbing a pole often rig up one just back of the seat and climb to its top. The height varies according to the desire of the rider, but is generally eight feet.

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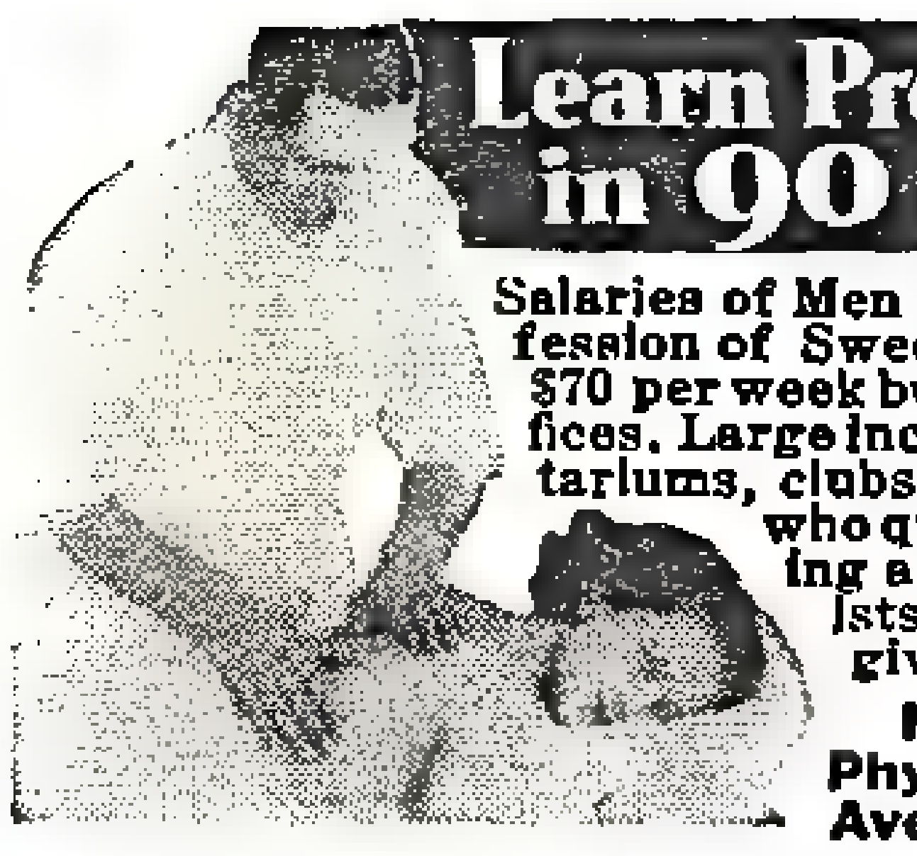

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Turning Pottery Projects On Wheel

[*Continued from page* 109]

To make good pottery, you must have good clay. Two methods are commonly used. One is called "throwing" and consists of placing a ball of rather soft, thoroughly kneaded clay on the wheel's center and working it to shape with the hands. To do this calls for an elbow rests, one of which is shown, so that the piece can be kept continually "on center." This is the fastest and also the most skillful method. The other plan is to use the coil method which was used to build the vase shown in some accompanying photos. For the coil method, the clay should have less water—just dry enough that it will not stick readily to the hands. First a ball about 1¼ inches in diameter is placed on the wheel. Now turn the switch and with a putty knife work the clay down flat, then cut off the uneven edge leaving a disc about ⅜-inch thick and 3½ inches in diameter.

Small portions of the clay are then rolled out into ropes about ⅜-inch in diameter as shown. A rolling pin or flat board will help to keep the piece uniform. Wet the clay slightly when making contact to insure bonding. Make the ends well joined by slight kneading. Build up several layers, then start the wheel and with a point or simply your wetted finger, work the outside smooth, then the inside. Then add more layers as the work progresses until finally you will have the completed article. The work must be kept centered. If the clay becomes too moist with frequent wettings, let it stand with a fan blowing against it or play the flame of a blow torch briefly over the area to be slightly dried. Too much heat will cause cracking due to uneven drying.

Before commencing a project, the plaster palette should be immersed in water until about half saturated. Then when the clay is placed upon it, the soaking of water from the clay into the plaster will cause a tight bond and with reasonable pressure during the molding there will be little danger of the piece slipping loose.

Slow setting plaster can also be used in place of clay with satisfactory results. Plaster of Paris sets too rapidly though and cannot be used for regular molding. Plaster pieces which are molded can, after drying, be given a luster by covering inside and out with clear shellac, varnish or lacquer.

Needed Inventions Prize Winners

[*Continued from page* 75]

being put through the boiler to remove the salt. The entire unit should be small enough to be packed by horse or stowed away beneath a life boat seat.

Almost everyone has experienced the difficulty of working on their automobile motor after nightfall without sufficient light. Pvt. M. W. Pawlowicz of the 5th Marines, Quantico, Va., found himself in this situation, and determined that a much needed invention was a flood light installed beneath the motor hood. For this idea Pvt. Pawlowicz wins the third prize of $5.

The three fourth prizes of $2 each went to Val Jameson, Wichita, Kansas; Leon Levy, Bronx, New York, and Steven Billcheck, Hollidays Cove, W. Va. Jameson suggests a siren attachment for the automobile fan which would remain inaudible while the car was traveling within the speed limits proscribed by law, but would howl with increasing power when the car exceeded the speed limit. The governor would be on the siren, not on the car. Levy recommends that a means be found for installing a small light within a doorknob so that when the knob is pressed, the keyhole is illuminated. Billcheck would like to see a built-in typewriter re-inker through which the ribbon could pass.

The four fifth prizes of $1 each went to Ewing Campbell, Murfreesboro, Tenn.; Mrs. Don Ross, Grand Rapids, Mich.; Louis La Grange, Allegan, Mich.; and to Donald Backe, Hammond, Ind.

Here are the contest rules:

1. In 100 words or less explain your idea for a needed invention. 2. This contest is open to everyone except employees of Modern Mechanix Publishing Co. 3. You don't have to buy a copy of the magazine or be a subscriber to enter. 4. Write your name and address plainly on your entry. No entries will be returned. 5. The editors of this magazine will be the judges. All decisions will be final. 6. Mail your entry to Inventions Contest Editor, Modern Mechanix Publishing Co., Greenwich, Conn. Entries arriving too late for next month's contest will be considered for the following month.

The Pre-Fabricated House Arrives

[*Continued from page* 122]

of cellulose dope, as used on airplane wings.

Copper has kept pace with the increasing use of metals in home building. Copper Houses, Inc., of New York City, recently erected a copper house at Washington, D. C., which to the eye presents no variation from a conventional home.

For the builder who prefers to take only partial advantage of pre-fabrication, a number of alternatives are available. The Berger Manufacturing Company of Canton, Ohio, markets standardized steel-frame units suitable for the framework of any house regardless of exterior finish. These steel units weigh but 42 pounds and can easily be erected by one man, eliminating the need for heavy erection machinery.

The Robertson system of cellular steel units is widely employed for floor and ceiling construction. These units are very much like metal planks two feet wide and four inches thick, made of a single piece of metal pressed into a series of deep square corrugations. Within these corrugations wood sleepers can be dropped and floors nailed to them.

One of the principal advantages of the pre-fabricated house is that rooms can be added to it at minimum cost as the family grows. It can also be completely disassembled and set up on a new site at a loss of only 20%.

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Plastics Change American Industry

[*Continued from page* 83]

producing still newer materials that will make beautiful and inexpensive furniture, automobile bodies—even houses? Research is trying, that is certain; and seldom does it fail. Meanwhile, the art of fabricating plastics is advancing steadily. The new automatic injection method of molding, in which a plastic almost ready to harden is forced under pressure into the molds and can be ejected in a few seconds, a finished product, is a case in point. By this method, too, whole sets of buttons, typewriter keys and other similar objects can be molded at once, instead of laboriously one at a time.

There is no telling what may happen next in this lusty infant industry. Molders now produce plastics in sizes ranging from tiny, jewel-like earring adornments to nine-foot, 4,000-gallon water tanks. The Ford Motor Company uses oil pressed from soy beans in the enamel finishes for its cars; and Ford is now experimenting with a plastic made of the soy bean meal, after the oil has been removed, mixed with formaldehyde. It is an exciting technological race; and modern plastics—those already in use and those still bubbling in test tubes—may well be the source of a new era of prosperity.

Paint, incidentally, gives a startling example of research's ability to jolt industry into new channels. Twenty years ago automobiles hastened through the assembly line only to languish for five weeks in the finishing shop. Today, because of the high development of nitrocellulose lacquers—made from plant fiber—cars are finished from the bare metal to the final polish in one day! That development was a rude awakening to a sleeping paint industry, which was suddenly forced to scrap old equipment and hurriedly reorganize to meet new demands. Plastics have already caused a similar re-gearing of basic industries, and undoubtedly will cause more.

Cellulose, which exploded paint theories and makes excellent plastics, is a marvelously versatile substance. It goes into the manufacture of such widely separated things as raincoats, cements, substitutes for leather, and the film which makes the modern motion picture possible. Into Cellophane it goes—and in a decade enough Cellophane has been manufactured to encircle the earth with a band 200 miles wide. It makes rayon, and a rayon cord as strong as structural steel of the same cross-section promises to double the life of automobile tires. Such things don't just happen; they are brought about by ceaseless, untiring research.

The laboratory has changed rubber from a sticky, ungovernable substance into a tough and sturdy one; it has transformed the tire from a mental and physical hazard into something seldom given a thought. Yet in automobiles it is generally the rubber parts that require replacement first; chemical tougheners have worked wonders, but there is still room for improvement.

It may seem strange that the Dupont laboratories, largely instrumental in bringing rubber to its present dependability, should now be engaged in perfecting synthetic rubber. Artificial rubber has long been the ardent dream of many a chemist. Why aim for a substitute when the natural product is so cheap and so much improved? The answer is largely an economic one. America gets its rubber from abroad. During the past decade, through foreign manipulation, rubber's price has gone as high as $1.29 a pound. Chemists saw that challenge. If they could do the impossible—produce synthetic rubber at a reasonable price—they could free the country from its dependence on foreign supply.

Research has done just that, using acetylene as a raw material. Dupont chemists, aided by the work of a Notre Dame professor, Father J. A. Nieuwland, have made artificial rubber that excels the natural product in many respects. Called "Duprene," this substance is already being manufactured on a commercial scale. An acre of rubber trees yields approximately 500 pounds of rubber in 500 years; but an acre-large factory can turn out 200 tons of man-made rubber in five hours! And the raw materials, including sulphur, salt and natural gas, are well-nigh inexhaustible. Natural rubber's weakness—its deterioration from contact with heat, oil, acids and alkaloids, is largely removed in "Duprene." Though it now costs a $1 a pound, six times the price of rubber, "Duprene" has already found a market in gaskets, tubing, and many other uses where rubber is exposed to chemical decay.

To those who remember camphor as a smelly substance applied in treating colds, it may be a surprise to know that camphor is an essential ingredient in pyroxylin plastics and safety glass. The only source of natural camphor is the Japanese island of Formosa. In short, we were long dependent on one small spot on the globe, subject to the vagaries of shipping, tariff, and the possibility of war, for an important product.

It is under these circumstances that research works at its best. No time is wasted in devising substitutes for natural products when they are cheap and plentiful. But let there be a threat of scarcity or high price, and immediately all the guns of science are pointed at a synthetic. So it was with camphor. In 1934, after over $3,000,000 had been spent in various laboratories in a vain hunt for artificial camphor, chemists of the Newport Company derived an excellent synthetic from American turpentine. This new synthetic is now helping make the nine million pounds of safety glass the automobile industry will require in 1936.

The cunning sandwich of materials that compose safety glass is a strange union of man's newest with man's oldest chemical achievement. Glass goes far back into ancient history. Yet the effort expended by plastic research is matched by the

[*Continued on page* 132]

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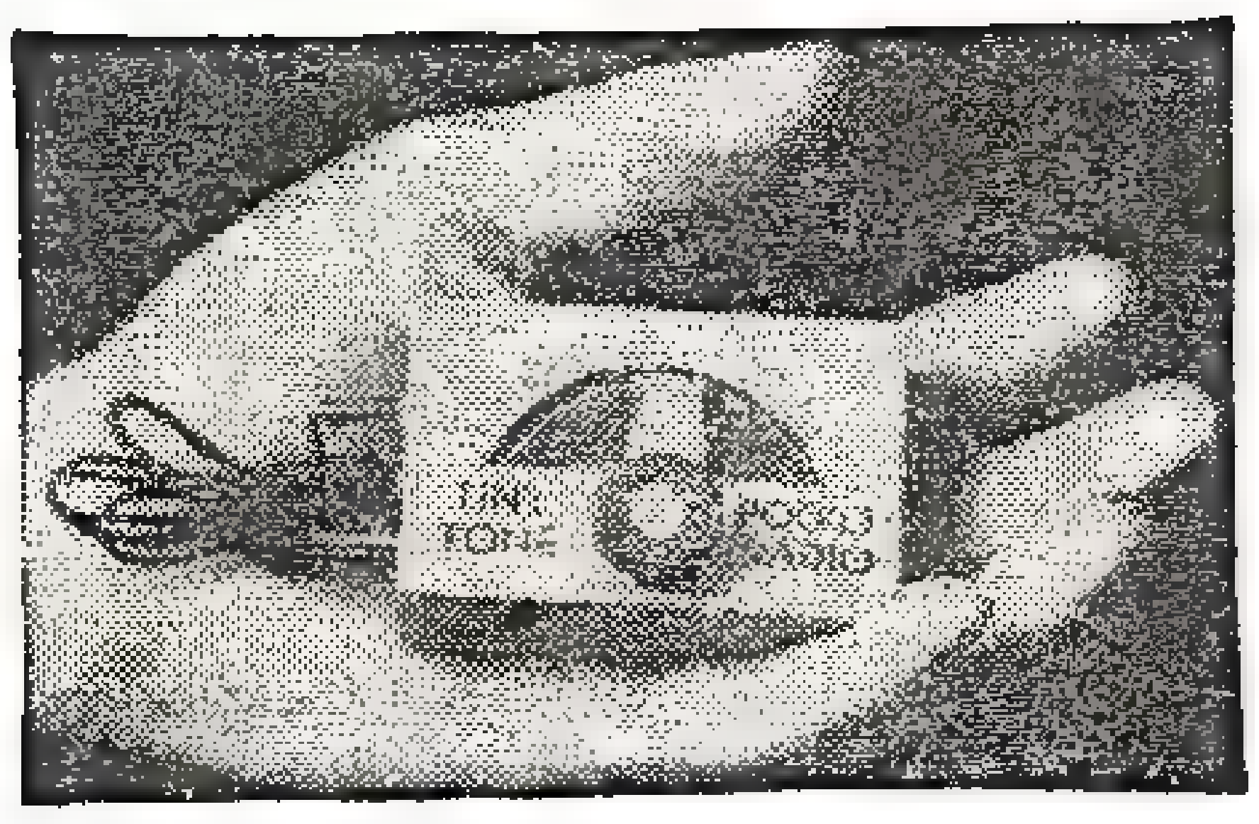
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Plastics Change American Industry

[*Continued from page* 131]

glass chemist's constant endeavor to transform his material with new life and new uses. The Corning Glass Works recently completed tests aimed at producing a material long considered impossible—a glass that would endure the terrific heat of direct flame on top of kitchen stoves.

During these trials, scientists with doctor's degress became cooks. Glass made from 1,500 different formulae was tested. To reproduce actual kitchen conditions, these eminent men presided over the frying of 18,000 pounds of potatoes in glassware over many kinds of wood, coal, oil, gas and electric stoves!

As a direct result of this ordeal by fire came Pyrex glassware that defies flame and can be used as a serving dish on the table. More that that, laboratory workers cataloged the performance of 1,500 glass formulae, and increased immeasurably their knowledge of the product.

From the same laboratory has come fibrous glass, spun to a fineness seven to fifty times that of a human hair. A glass wool made up of these fibers resembles cotton batting, and is used extensively as insulation in ships and electric refrigerators, where vibration causes ordinary insulating material to settle. In addition, these superfine fibers have been wound around electric wires for insulation with excellent results; and they have been twisted into yarn and woven into textiles!

Today we wonder at the marvel of plastics, at the adaptability of glass. Tomorrow may see still a new material, with new advantages. It has been said that the pen is mightier than the sword but the fragile glass test tube bids fair to outrank them both.

Training Army Air Fighters

[*Continued from page* 39]

of securing a permanent commission in the Air Corps.

From the start of training all students think of but a single topic—flying. During the first or second week in November the all-absorbing topic of conversation is the first solo. Some morning after a particularly rough landing, the instructor clambers out of the ship and says: "Well, you can't do any worse alone." The fledgling gulps twice to swallow his thumping heart and gives her the gun. At 400 feet he wiggles the stick a couple of times, tentatively, just to see if the ship recognizes him. A few turns and he glides in to a breathlessly happy landing. The solo is successfully accomplished! That alone has been sufficient recompense for hours of study and training. If a "washing out" takes place next week, the solo has made it all worthwhile.

Although construction of Randolph Field was started in 1928, it was not officially dedicated until 1930. The first buildings were occupied by school troops on Oct. 15, 1931, when the Primary Flying School and the School of Aviation Medicine from Brooks Field, the Air Corps Training Center Headquarters from Duncan Field, and the Primary Flying School from March Field, Calif., took up permanent residence. The project as it now stands represents a total investment of some $12,000,000 exclusive of aircraft, supplies and equipment.

The land, on which stands the most complete and modern air training center in the world, consists of 2,368 acres, of which 400 acres in its geometric center are confined to the building area. The remaining 2,000 acres, comprising four distinct landing areas, known as the "NORTH," "EAST," "SOUTH," and "WEST" fields, completely surround this central web-like pattern of buildings and streets.

Officers Have Own Homes

The Administration Building, which houses the photo section, administrative offices, War Department theater and the post office is the predominating structure on Randolph Field. It rises to a height of 175 feet and overlooks the surrounding plain. At night, the beams from a powerful revolving beacon atop the tower can be seen by flyers for a distance of 50 miles.

The circular residential area in the center of the great flying field has in its exact center the Officers' Club. The officers' homes surround the club, being symmetrically spaced on the concentric circular streets and radial spoke-like roads. The majority of the homes are of two-story design, but a number are of the bungalow type.

Flanking the administration building at the left of the main double boulevard entrance to the field stands the Post Chapel, a magnificent structure of Spanish design. Just across the main traffic artery is located the Post Exchange. This building consists of three separate wings. One houses the Post Exchange proper, the second is occupied by a grocery store and meat market, and the third by a restaurant and beauty parlor.

Flying Cadet Club Organized

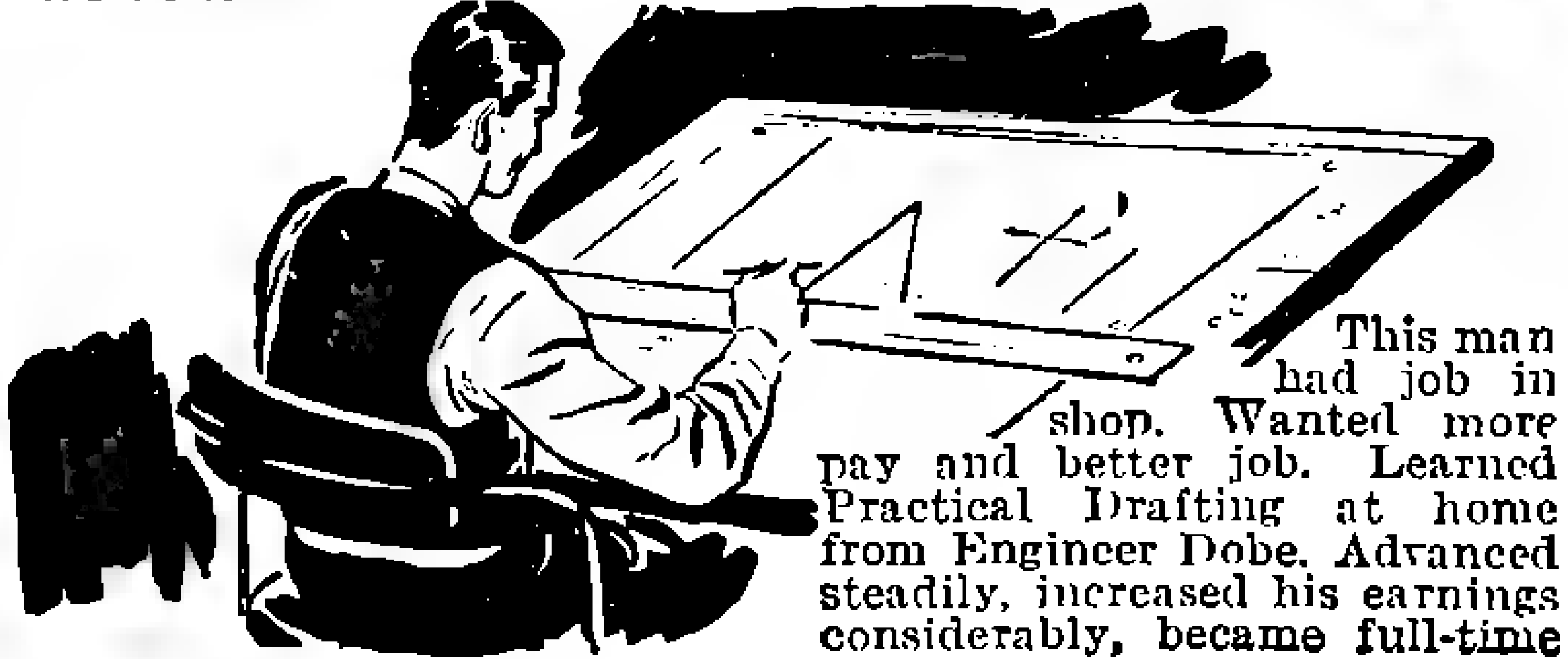
Forming the boundary on the west and east sides of the building area are eight hangars. Each one measures 220 feet in length, 110 feet in width and is 47 feet high. On the northwest boundary, two large warehouses house the Post Quartermaster and the Air Corps Station Supply.

The organization of the new Flying Cadet Club in San Antonio is indicative of the constructive and ceaseless activity towards bettering conditions with the Cadet Detachment. It is largely through this effort that the Cadets now find themselves enjoying club rooms and privileges which are far superior to those of the recent past.

Such is the institution which today receives, trains, educates and transforms into pilots—the youth of America. Young men, who yesterday were no different from thousands of others throughout our Country, upon graduation are the equal of any airplane pilot in the world.

WHAT KIND OF MAN ARE YOU?

This man has routine job in shop. Would like to earn more money, advance to better job, but does nothing about it. Will be doing same work 20 years from now.



This man had job in shop. Wanted more pay and better job. Learned Practical Drafting at home from Engineer Dobe. Advanced steadily, increased his earnings considerably, became full-time draftsman.

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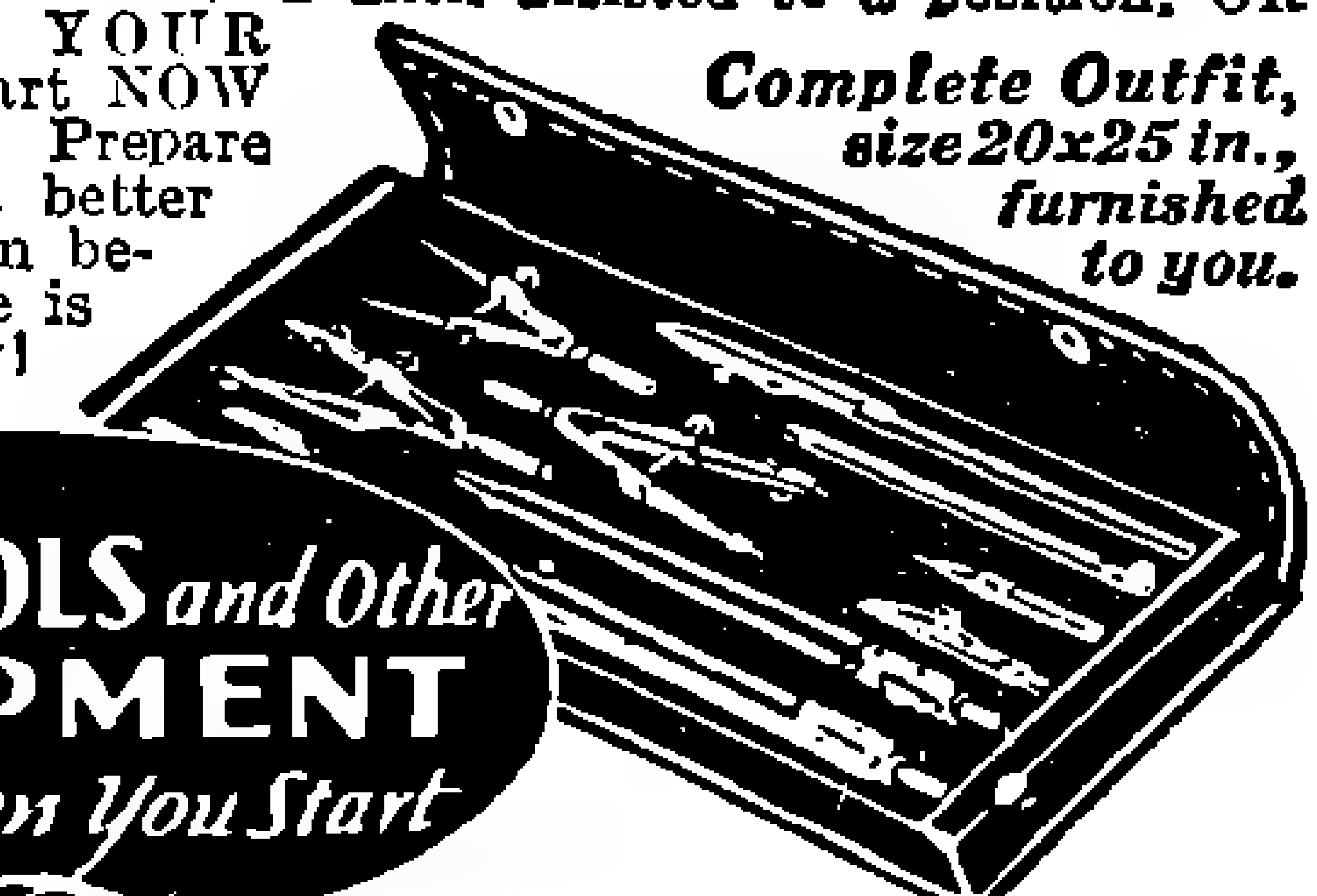

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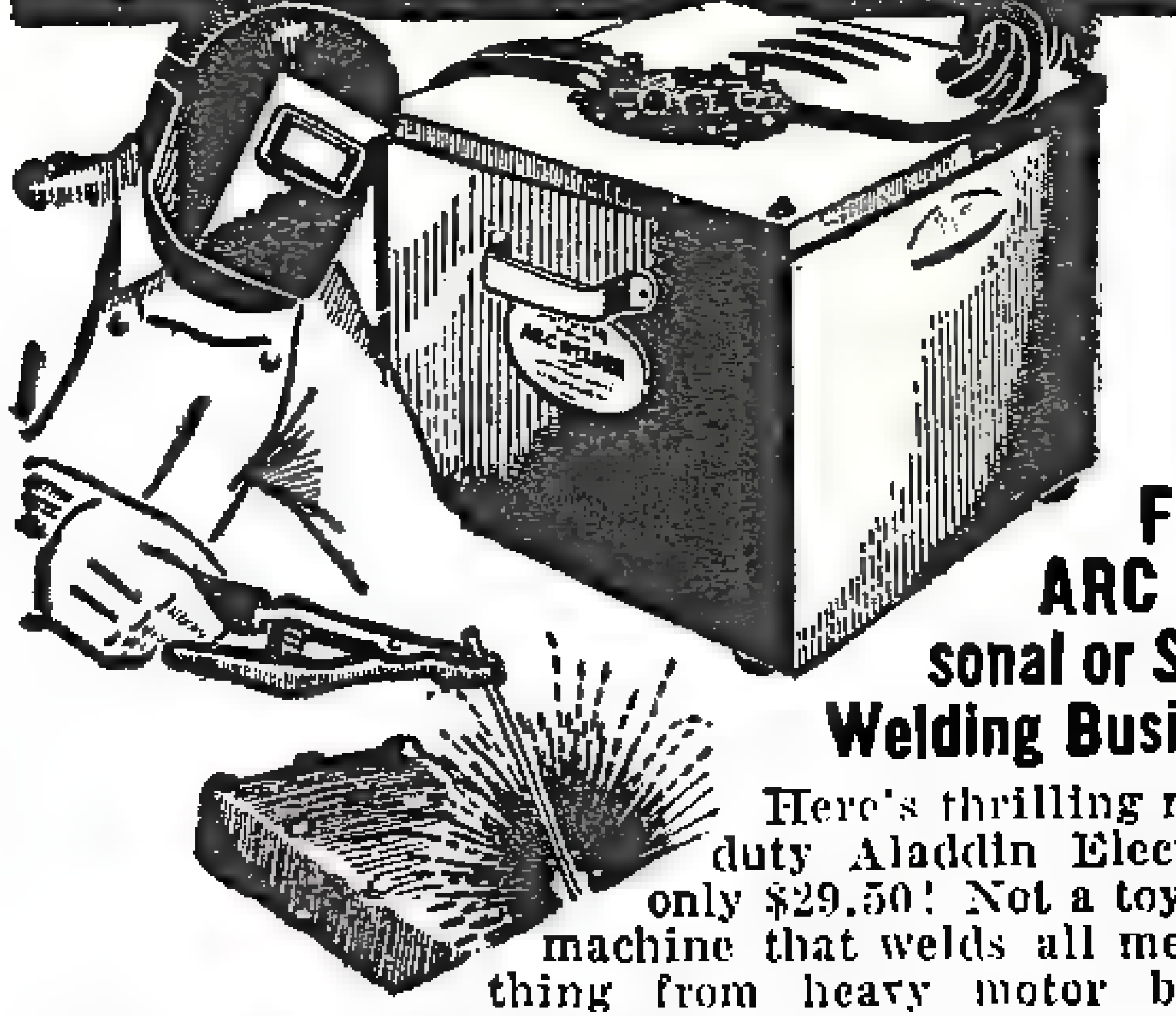

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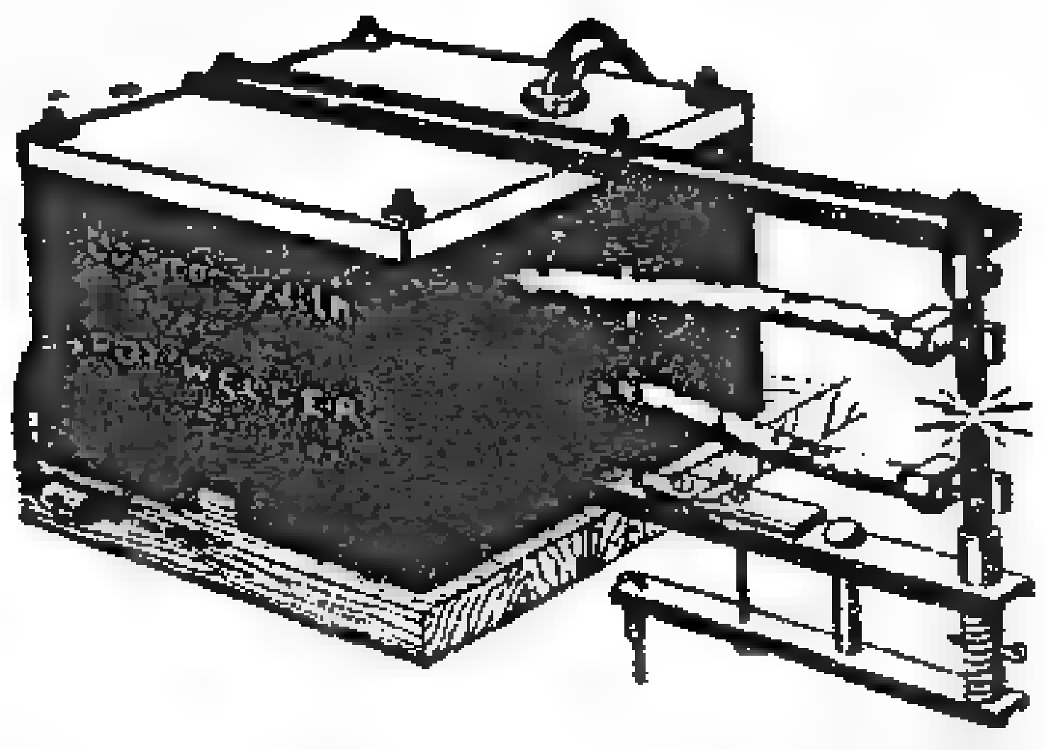

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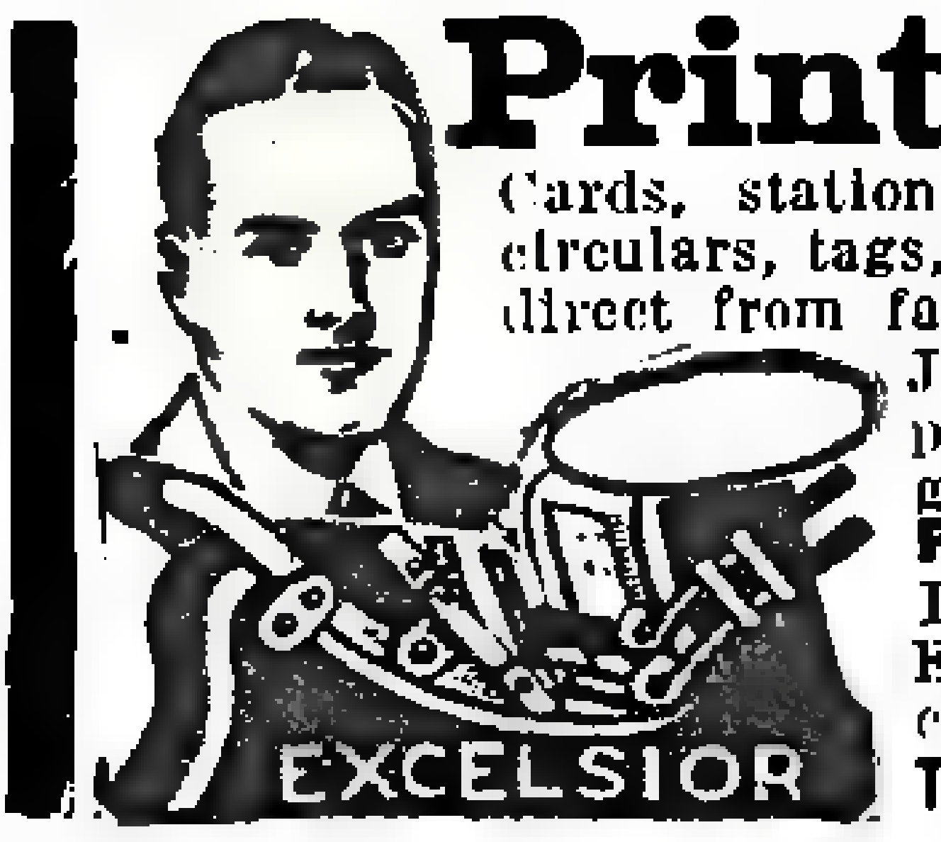

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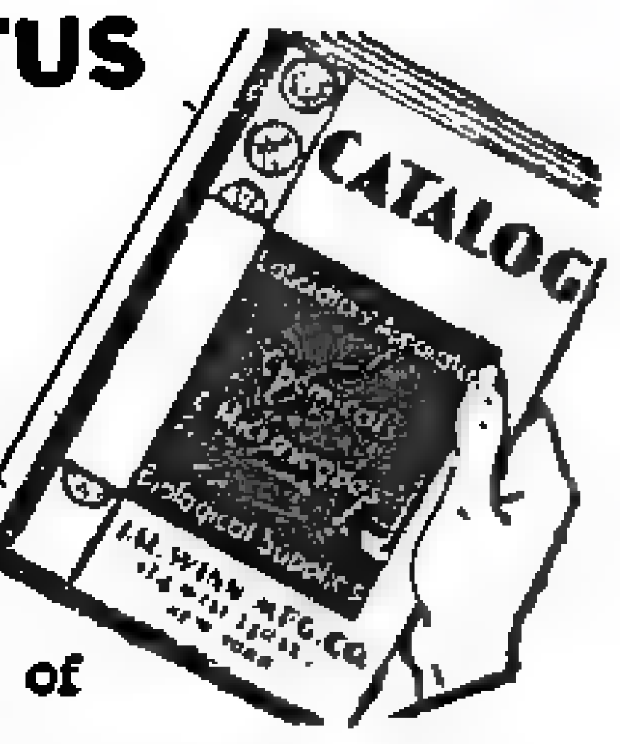

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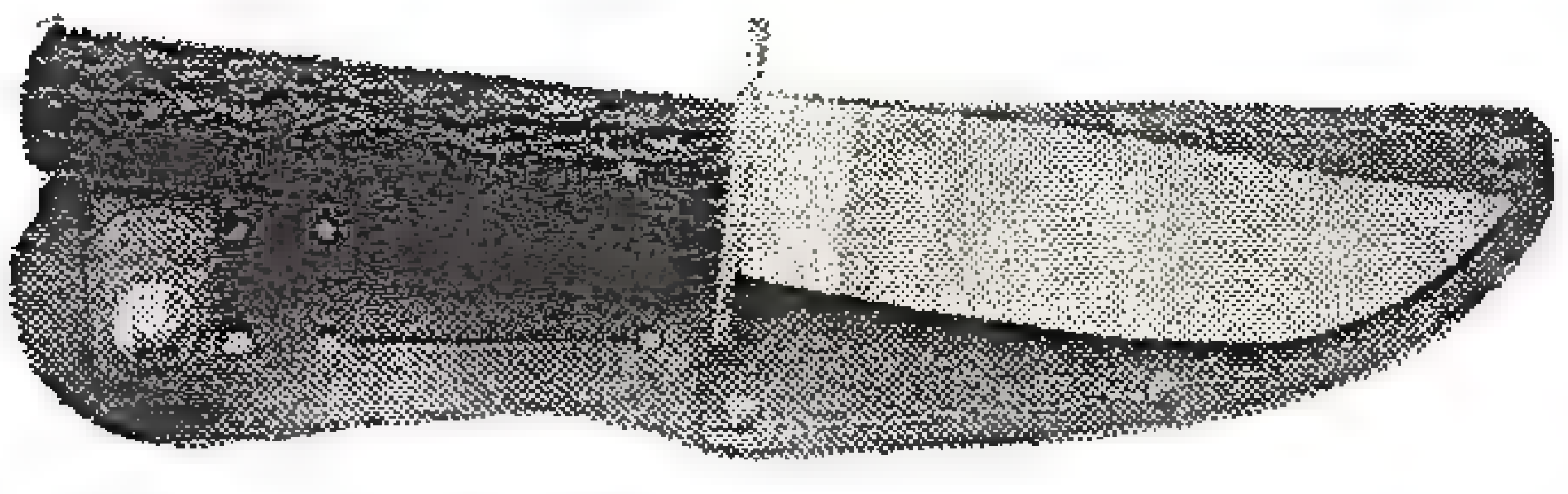

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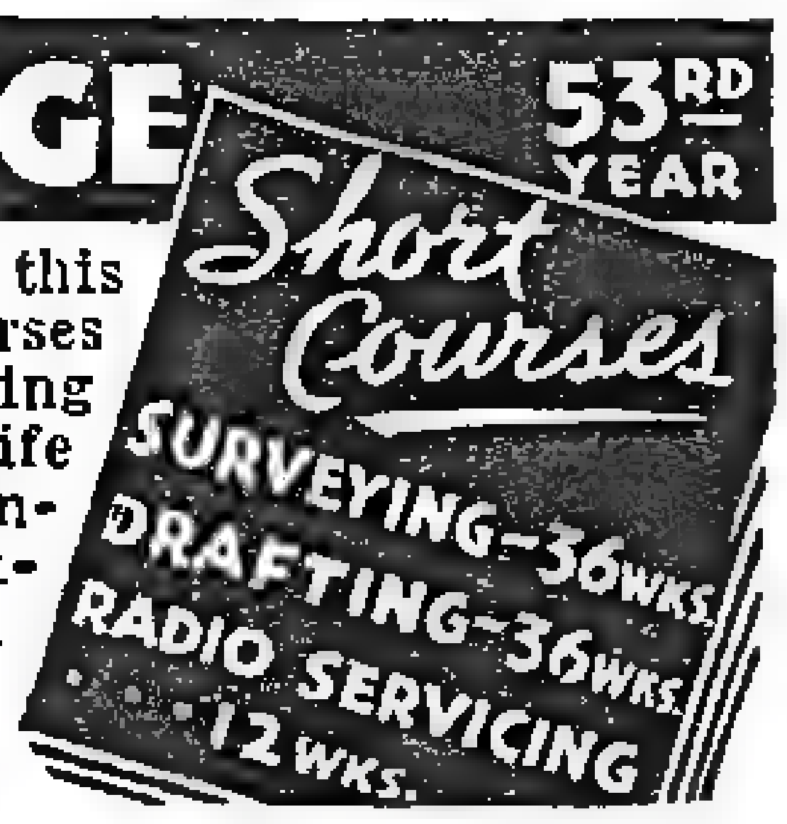
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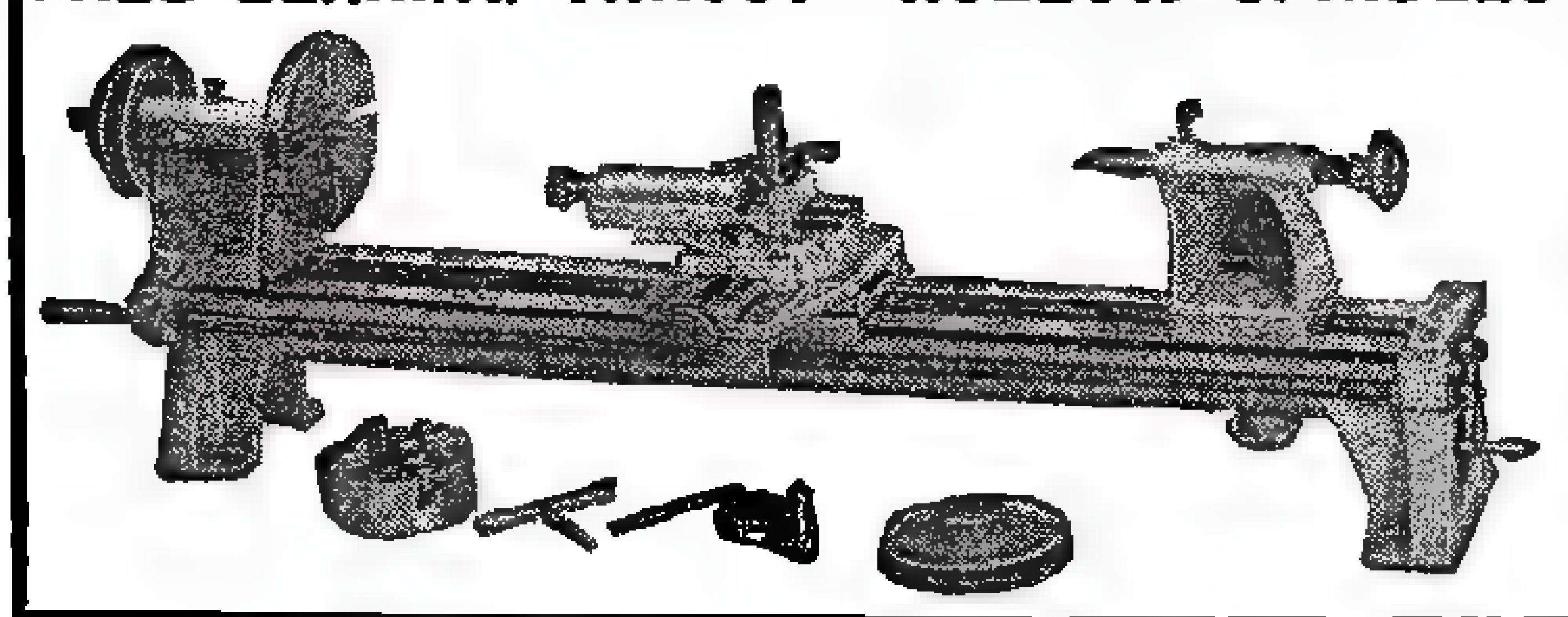

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Dept. B9, 10 S. Clinton St. Chicago, Ill.

Making Boats Go Faster

[*Continued from page* 49]

tons, Miss England's slightly more than five tons. Miss America X had 6,400 horsepower with four engines, Miss England 5,000 with two engines.

Our American motors were developed by a private industrial concern. Such companies are interested in economy and efficiency. But the motors we need to power future Harmsworth hydroplanes need not be efficient nor economical.

Our Packards, for example, use between seven and eight hundred gallons of gasoline an hour. The special highoctane gasoline we use costs one dollar a gallon. For any commercial purpose a motor so expensive to operate would be impossible to sell.

No Subsidies For America's Boat

In the United States the development of super-speed marine engines is strictly a development by an individual who happens to be myself. No endowments or government subsidies figure in the case. The motors in Miss England III were financed through government endowment.

The problem, of course, is not just one of power; it is a problem of *power versus weight.* Engines that are merely powerful will not suffice. They must be powerful AND LIGHT.

It is amazing how an apparently useless competition for purely honorary achievement, such as the Harmsworth, often results in substantial commercial benefits. The entire course of an industry is frequently changed by someone's desire to win a race or capture a trophy worth a few dollars at most.

Let me tell a story to illustrate:

Back in the early days of motorboating, builders of marine engines got themselves into a mental groove. Then the world war brought the development of the high-speed light-weight aviation engine. To me, and to a few other motorboat enthusiasts, these aviation engines appeared admirably adapted to water craft.

Aviation Engine Approved

But the "old guard" marine engine makers consistently opposed the use of aviation engines in boats. In 1923 I entered one of my Baby Gar runabouts, in the Carl G. Fisher race. This was a race for "gentlemen's runabouts," and the rules specified that the boats should be powered with marine engines. The rules committee barred my entry three successive times after we had won the races. They said the Baby Gar carried an aviation engine.

I appealed to the American power-boat association for a definition of a marine engine. Their answer was: "any engine manufactured or assembled, and sold or offered for sale as a marine engine, is a marine engine."

This gave us a chance to use a Liberty motor we had purchased at junk prices after the war. We rebuilt it, and put it in a Baby Gar Runabout. We advertised the motor for sale as a marine

[*Continued on page* 137]

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No soliciting! No canvassing! We show you how to make big money decorating fast-selling Giftwares. We start you with the big $10 Artist's Outfit shown above. We supply you with $150 worth of Giftwares free of extra charge and show you how to dispose of them without leaving your home. We give you 29 Tested Plans for making money. One Fireside Member says, "I made $100 on furniture in one week." Another writes, "My sales were $500 for 5 weeks. This is my first year." R. M. P., of Ill., says, "I did $3,500 worth of business last year and over $12,000 this year." D. W., New Mexico, reports, "I would not take $1,000 for my Course."

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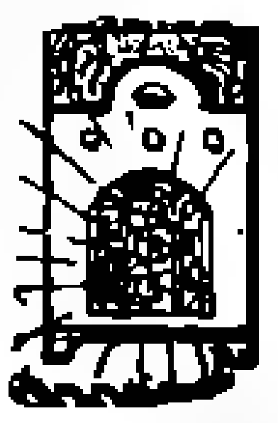

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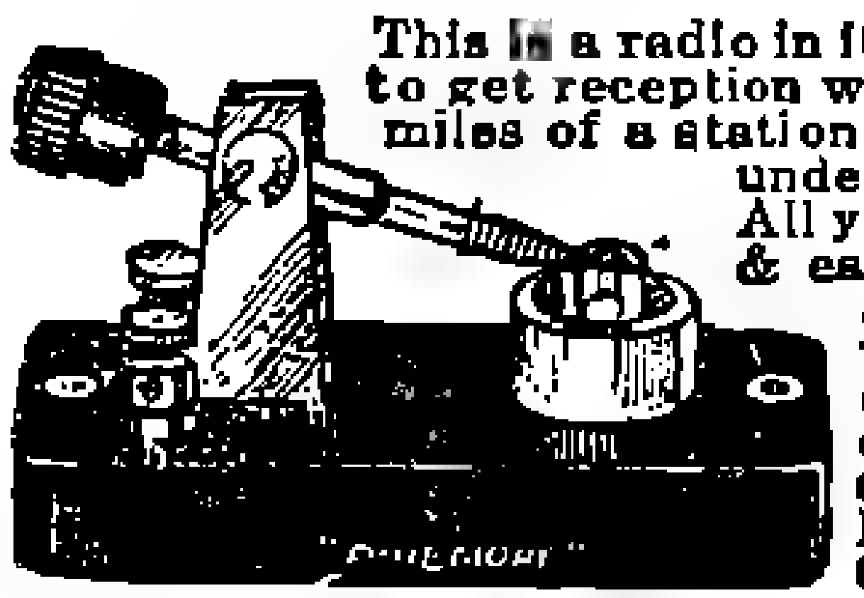

This is a radio in itself, as it is possible to get reception with it alone within 25 miles of a station (or up to 100 miles under good conditions). All you need is an aerial & earphone. Completely assembled and wired, with supersensitive crystal, stand, base, crystal cup, arm with cats whisker, etc. Reception guaranteed. **Only 25c ppd.**

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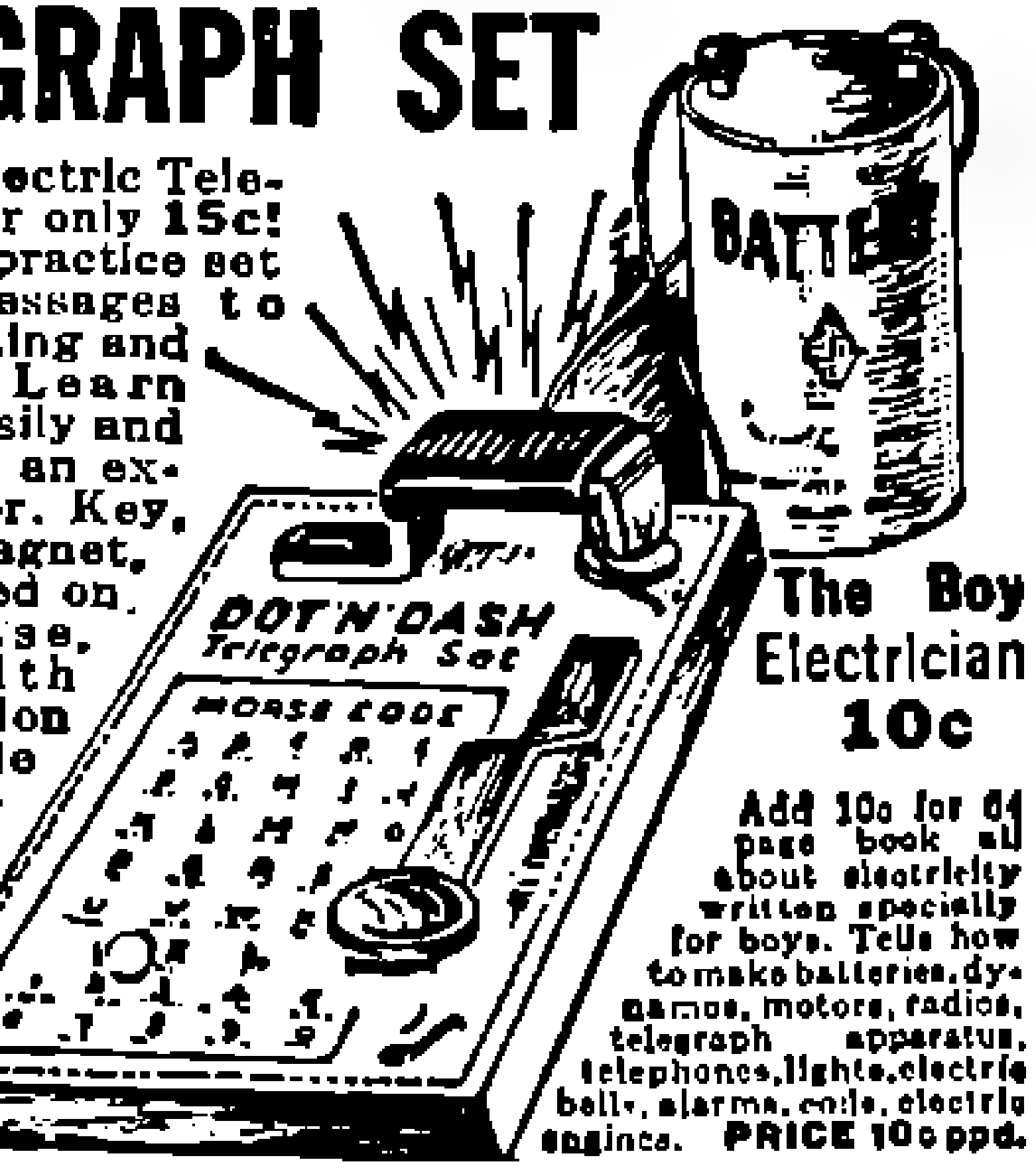

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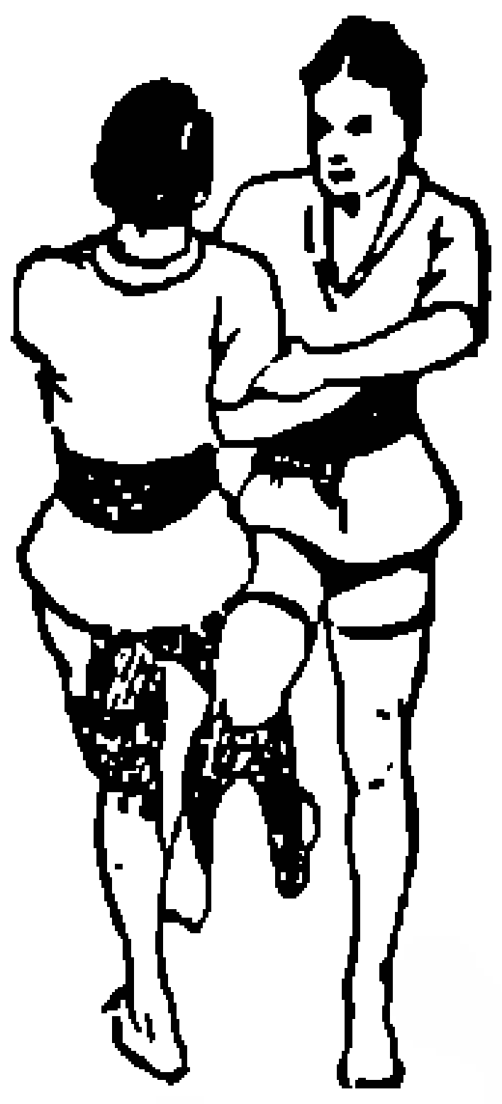

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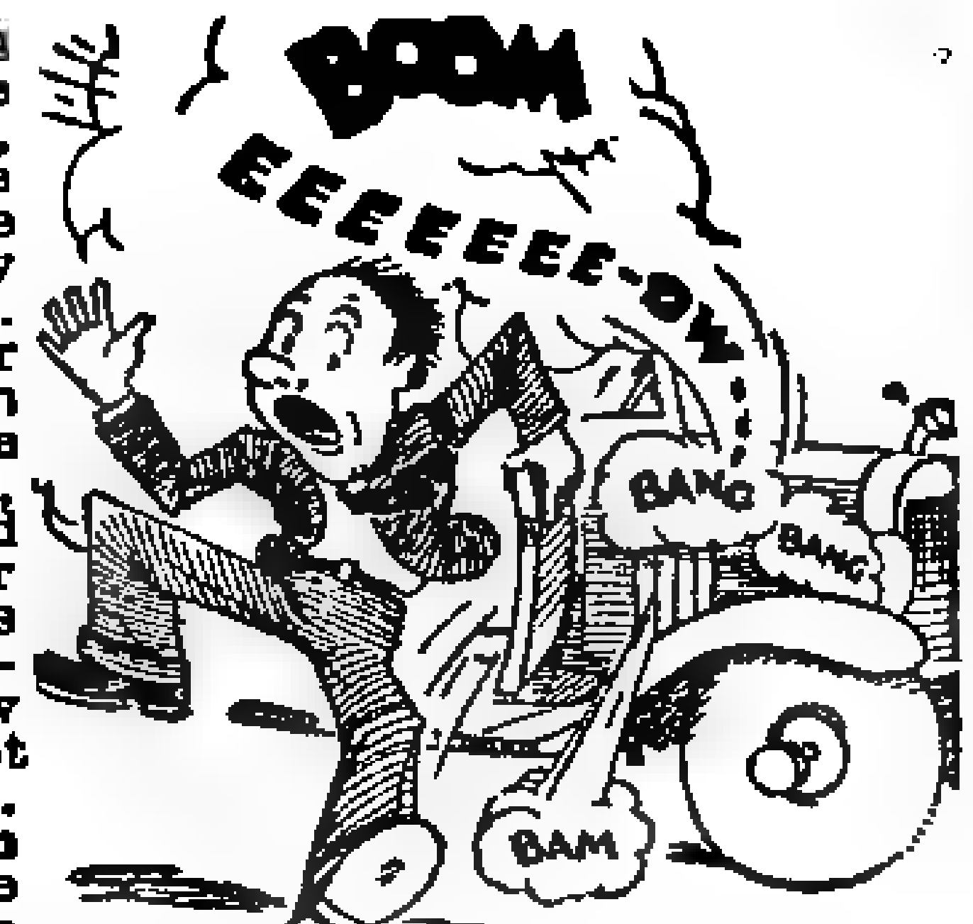

The Auto Bomb is attached to the motor of your car, one wire to the spark plug and the other wire to any part of the motor. The instant your "victim" steps on the starter, there is a shrill whistle, followed by a loud bang. The driver thinks his car has exploded. Attached in a few seconds. Does not harm the car. More protection than an insurance policy-catches the thief in the act. **Price 15c each, 3 for 40c. $1.35 per doz. Shipped by Express. Not Prepaid.**

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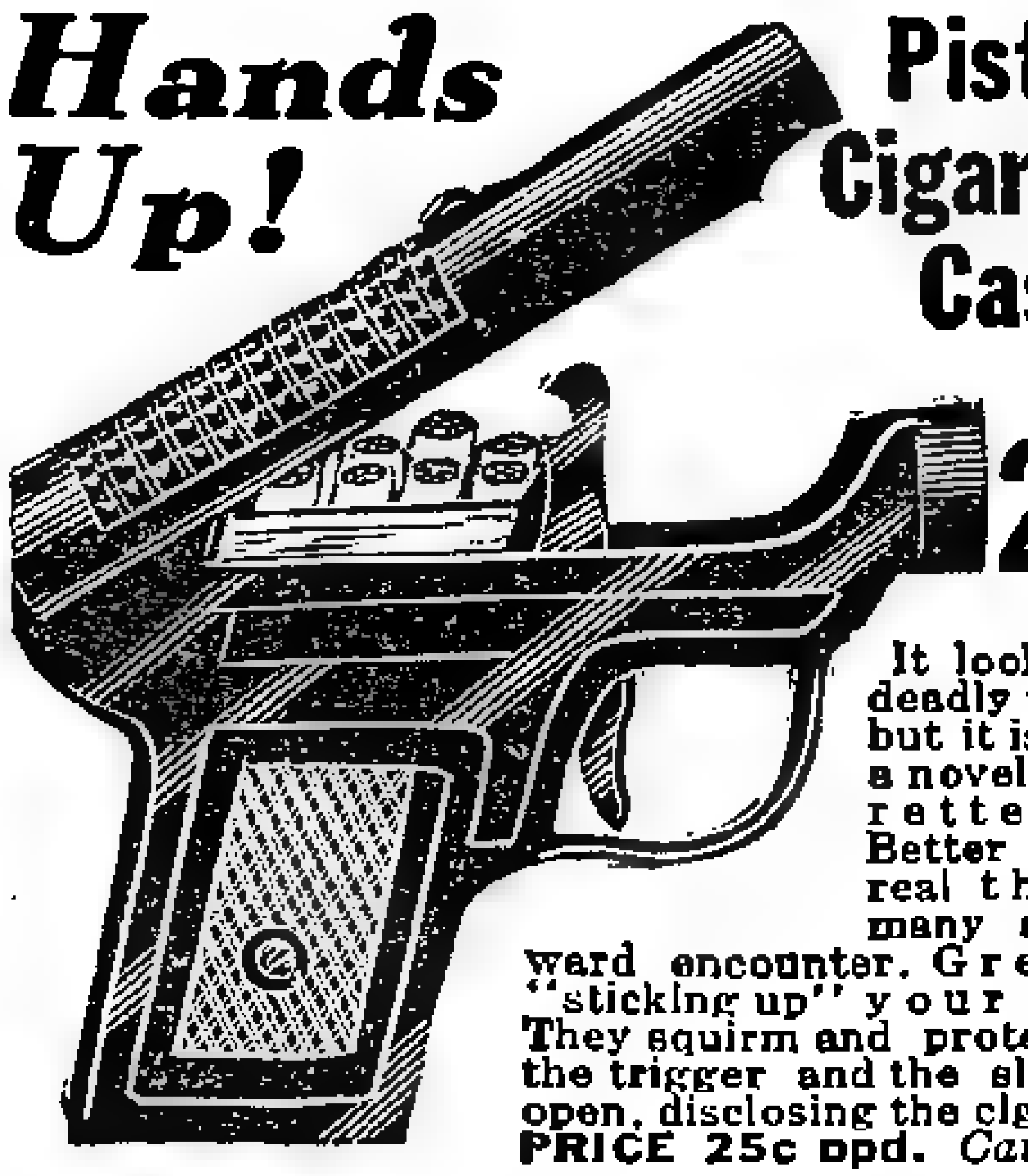

It looks like a deadly weapon, but it is merely a novel Cigarette Case. Better than the real thing in many an awkward encounter. Great fun "sticking up" your friends. They squirm and protest. Pull the trigger and the slide flies open, disclosing the cigarettes. **PRICE 25c ppd.** *Catalog 10c*

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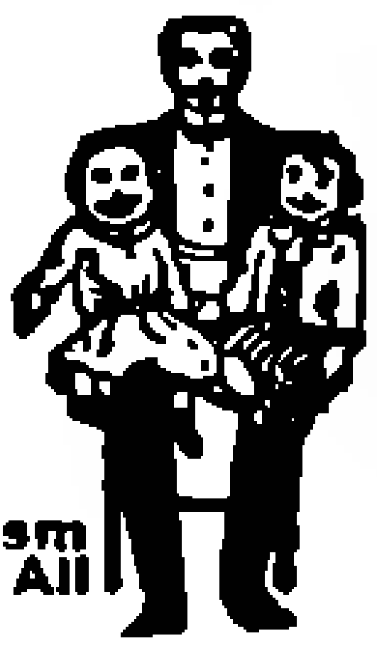

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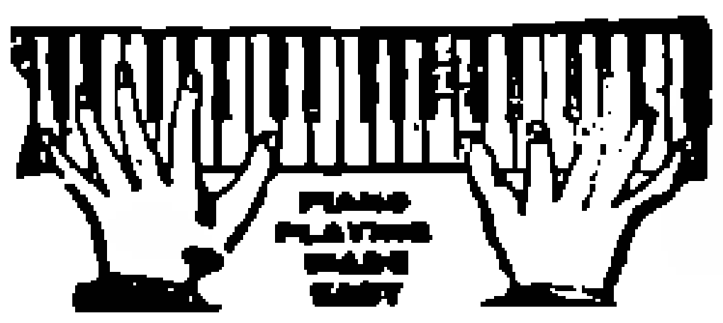

Would you like to play the piano or organ without going through the drudgery of learning the scales and keys and without tedious practice? The **Vamping Tutor** is a greatly simplified method, which, after a little practice, enables you to play the accompaniment to any tune or song written in any "time" or in any "key." No knowledge of music necessary. Once you have mastered the system, you will be able to play the accompaniment to songs, ballads, waltzes, the latest hits, etc., entirely by ear without any music. **Price 12 cents postpaid.**

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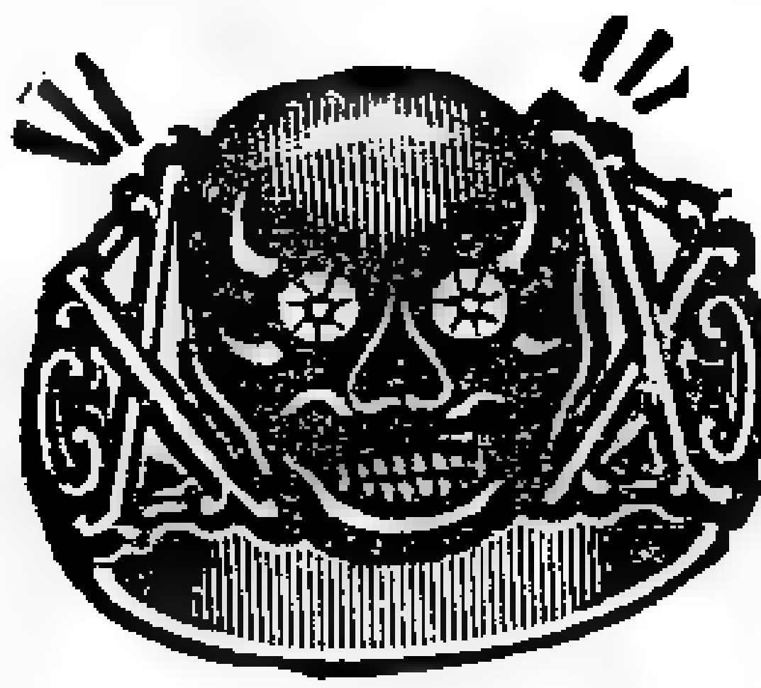

Very striking, quaint and uncommon. Oxidized gunmetal finish; skull and crossbones design; two brilliant flashing imitation rubies or emeralds sparkle out of the eyes. Said to bring good luck to the wearer.
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250 Magic Tricks

MAGIC MADE EASY

An excellent little book containing 250 Parlor Tricks, tricks with cards, coins, handkerchiefs, eggs, rings, glasses, etc. So simple that a child can perform them. Profusely illustrated. Entertain and amuse everybody.
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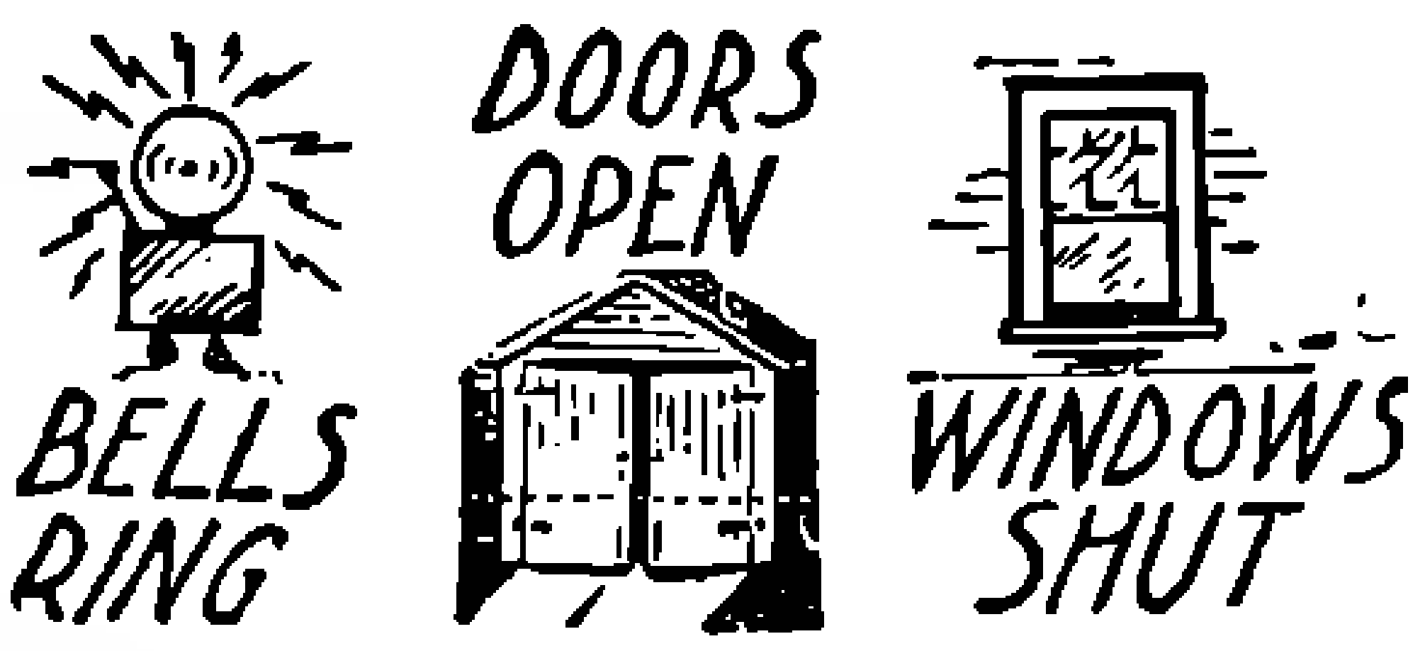

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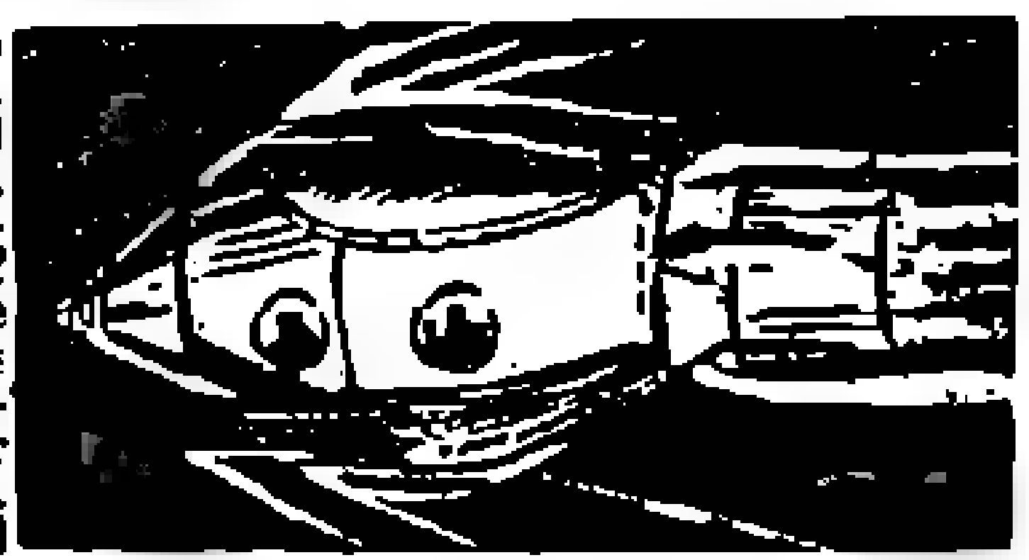

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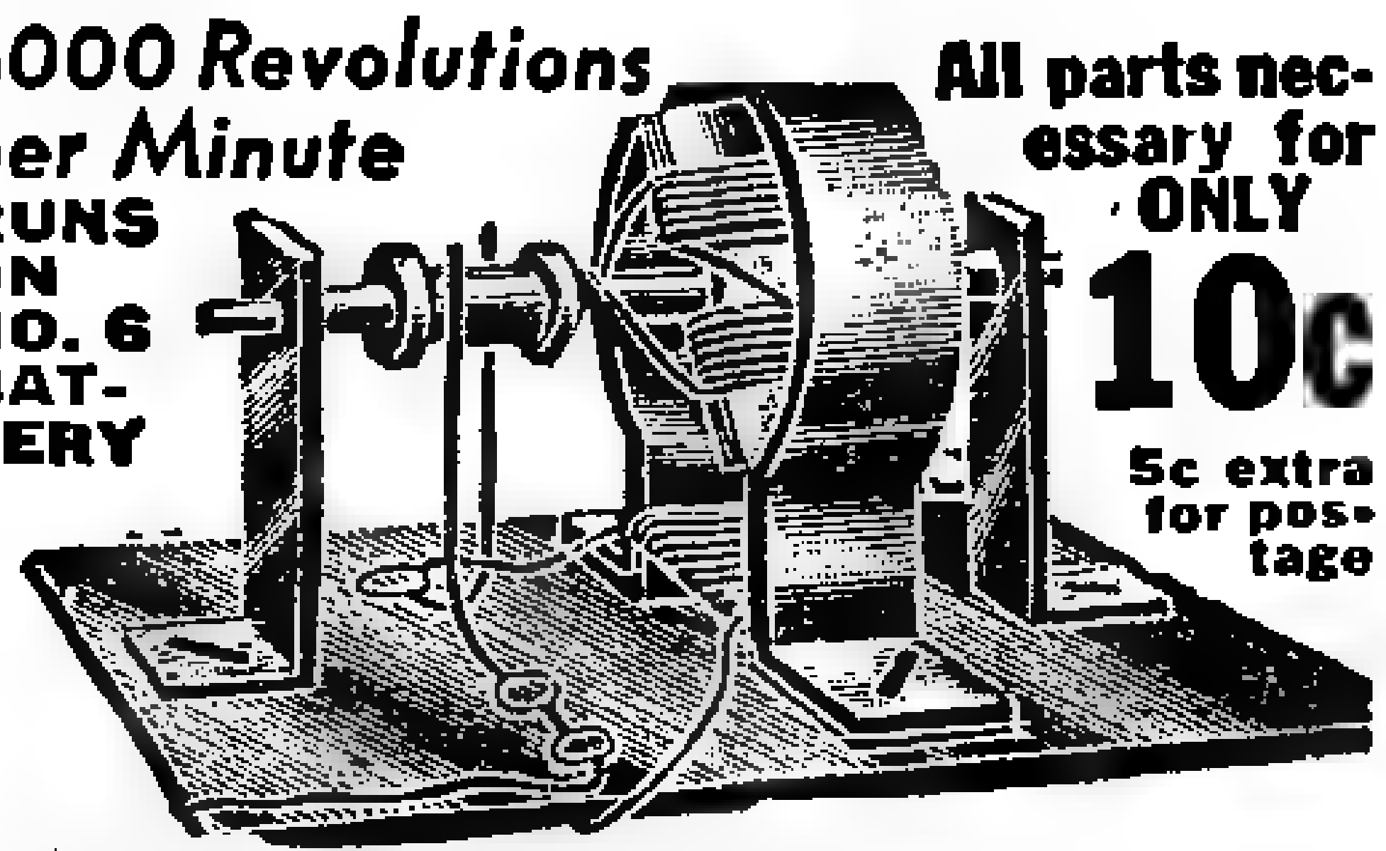

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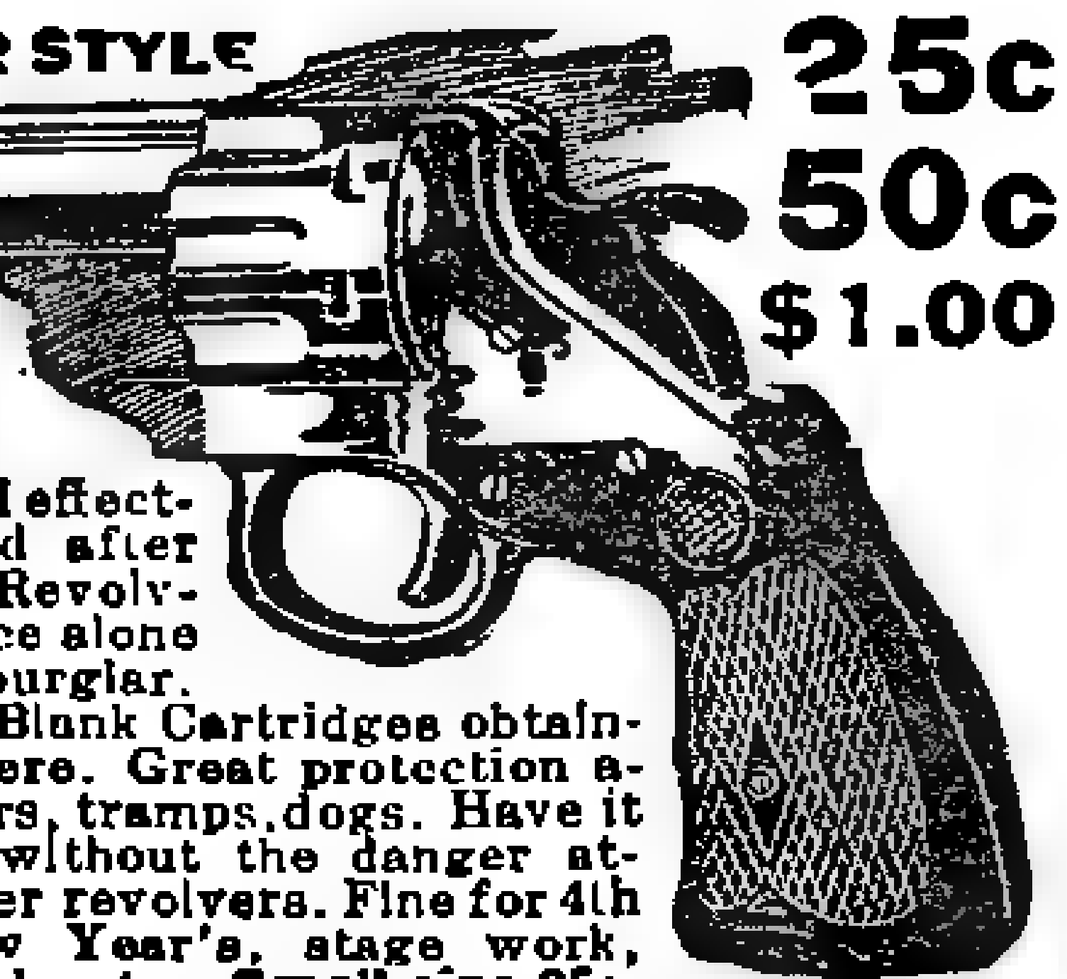

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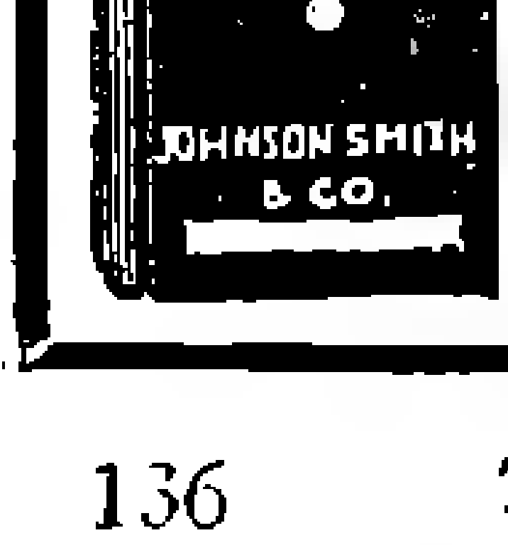

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Tackle Suggestions For Bass Fishing

[*Continued from page* 65]

enamel, six strip construction. The seamed bait rod while it has a considerable sale has practically been superseded by the new seamless tubular rods, the same being drawn from a short length tube of steel. A bait rod in the seamless tubular type answers almost perfectly to the demands set up for an all-around rod to be used for casting all manner of lures and the playing of many various weights and species of fish.

The single action and automatic reels are both used in bass fishing with a bass fly rod. Of the two it is certain that the automatic reel is the best and most efficient. A reel of the sort makes it possible to pay strict heed to the fishing and the activities of the lure without dividing the attention between what is going on with the reel and the destination of the lure. A 50-yard reel is most suitable for bass fishing and like all-around work. A reel of the sort will hold a double tapered HFH line.

In making a reel selection for your bass fly rod let it be understood that the balance as between the rod and the reel must be observed if the best results in casting are to be had. Experience with such outfits has taught that the reel with line on it should weigh one and one-half

[*Continued on page* 143]

Making Boats Go Faster

[*Continued from page* 135]

engine, thus fulfilling the qualifications of the definition. It wasn't our fault that nobody wanted to buy it. Maybe our price of $25,000 was a little high. . . . Anyway, the rules committee had to let us in.

The race was held in Buffalo, in the summer of 1923. The race committee got something of a shock when Orlin Johnson, my mechanic, and I appeared. We were both in formal attire—top hats, white gloves and all.

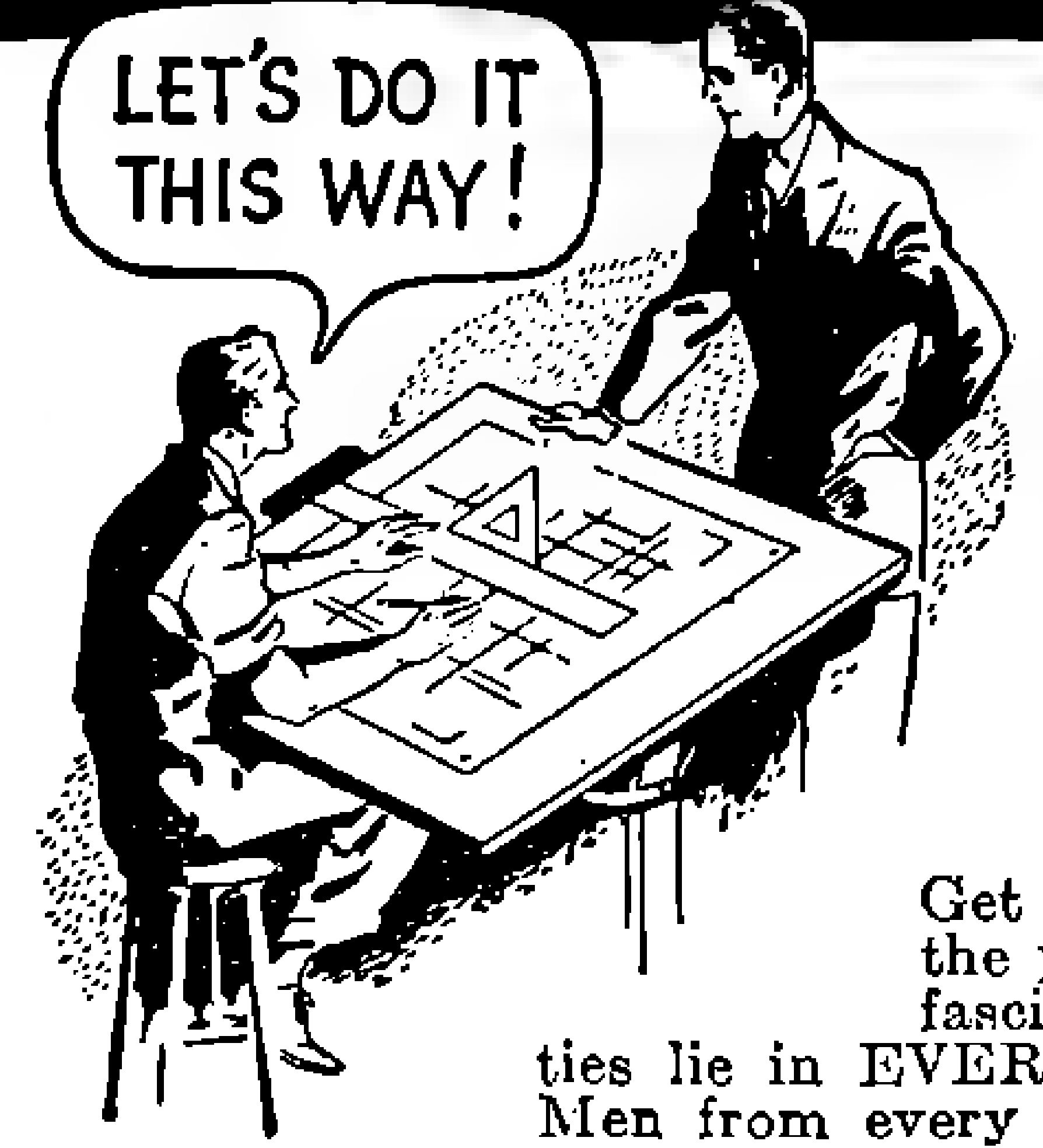
"What's the idea?" the Committee wanted to know.

"Well," our answer was, "The rules describe this event as a 'gentlemen's runabout race' and we're taking no chances of being disqualified. We're gentlemen!"

The other contenders in the race never got near us. We had a motion picture camera mounted in the stern of the Baby Gar. During the race it ground out pictures of all the other boats until they fell too far behind.

That was one of the most satisfying larks I ever had. But the serious point of it is, that after that race, nobody quibbled about the marine and aviation engines. The incident helped to force recognition of a new era in marine motor development. Today the aviation engine and the marine engine (except the small outboards, of course) are becoming fundamentally the same.

No machine can ever take a DRAFTSMAN'S JOB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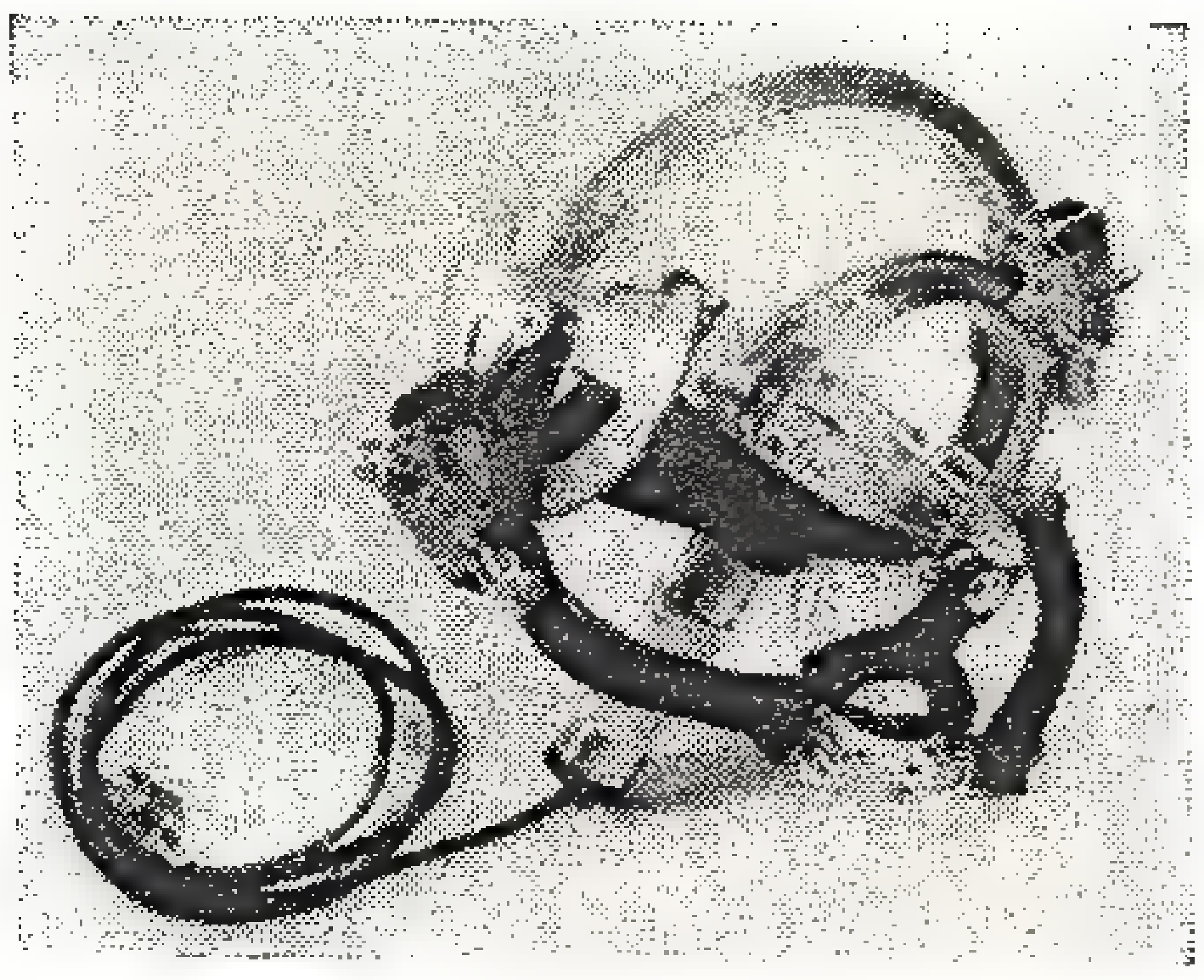

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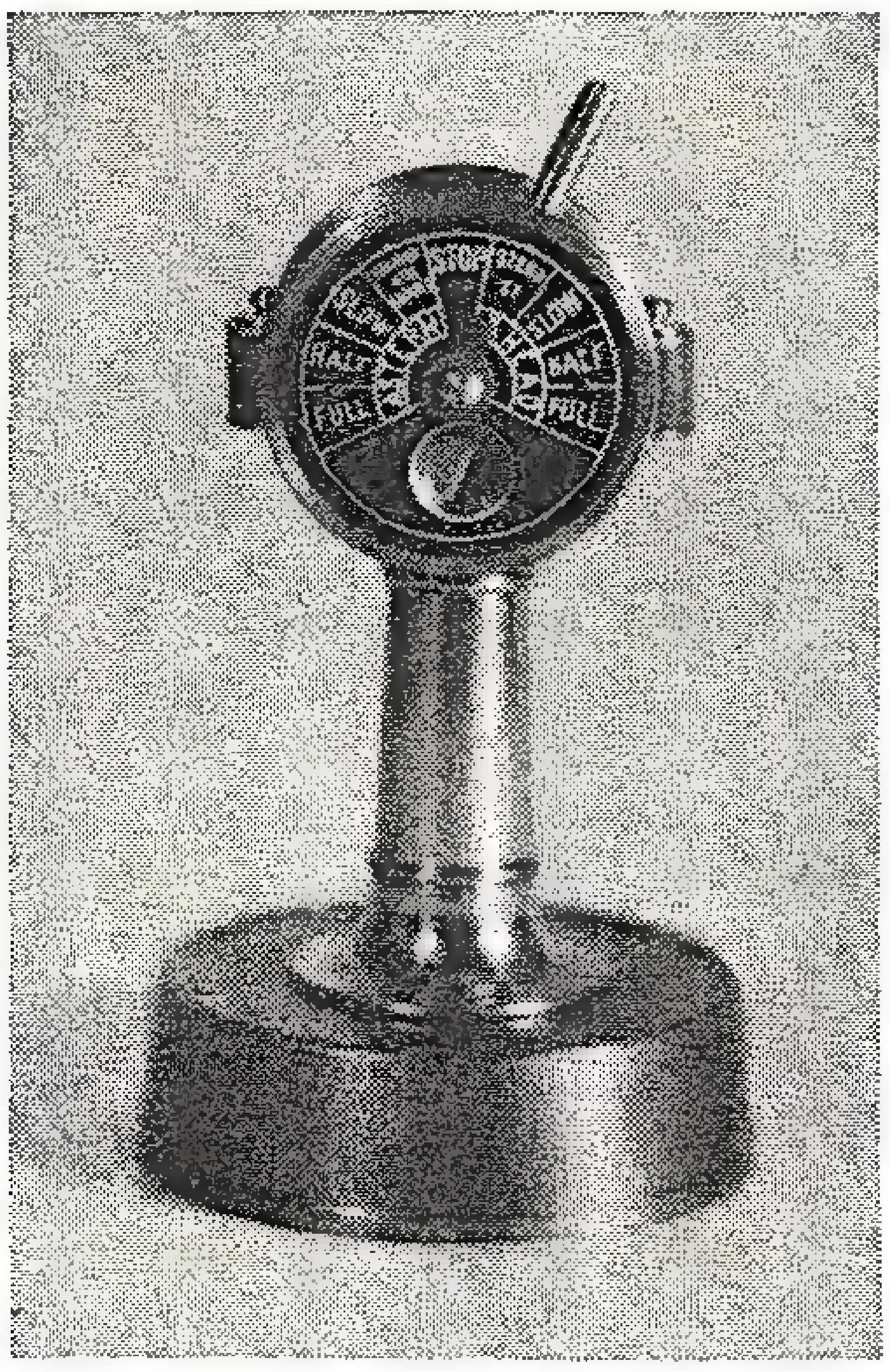

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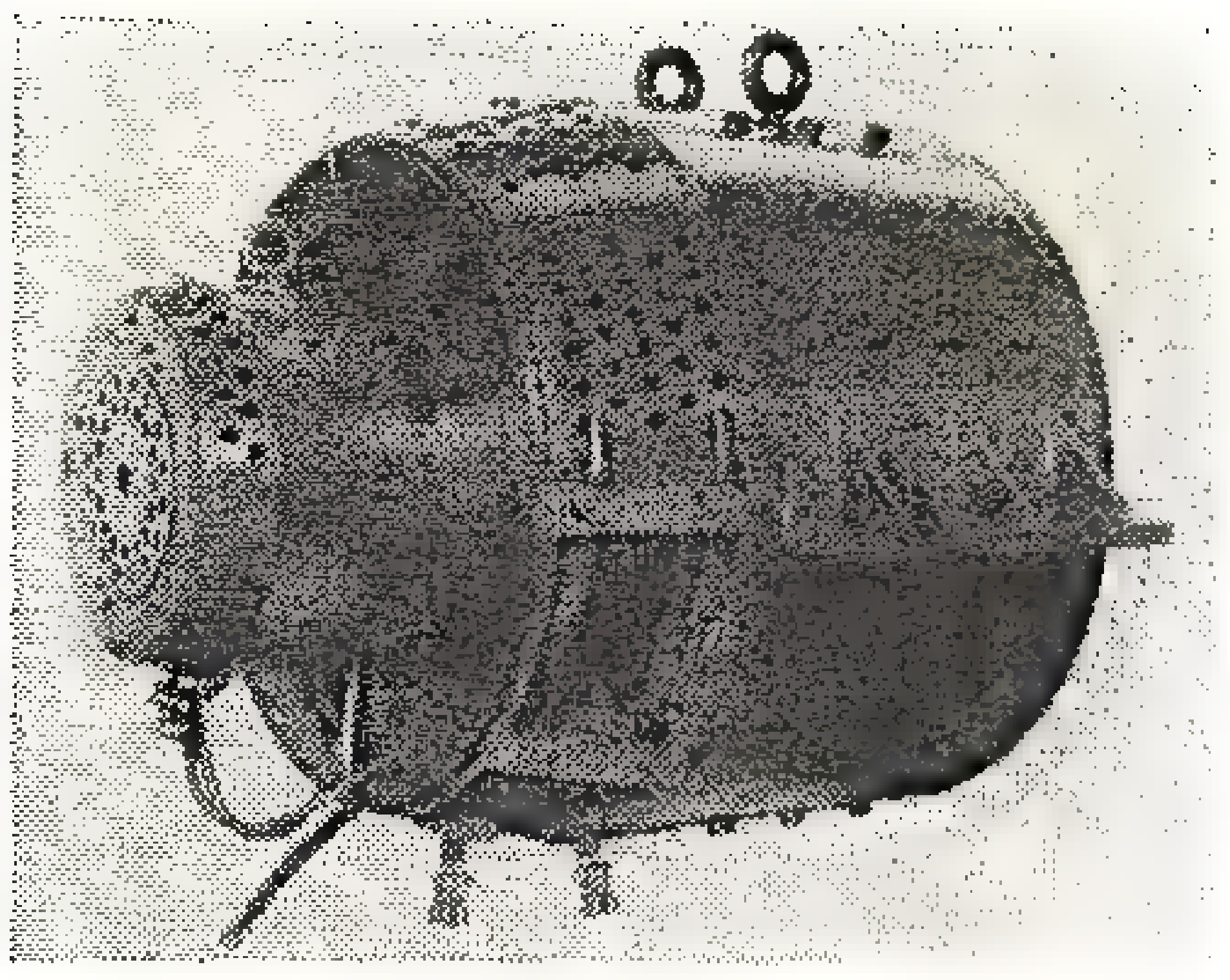
Giant Generators Light New Trains



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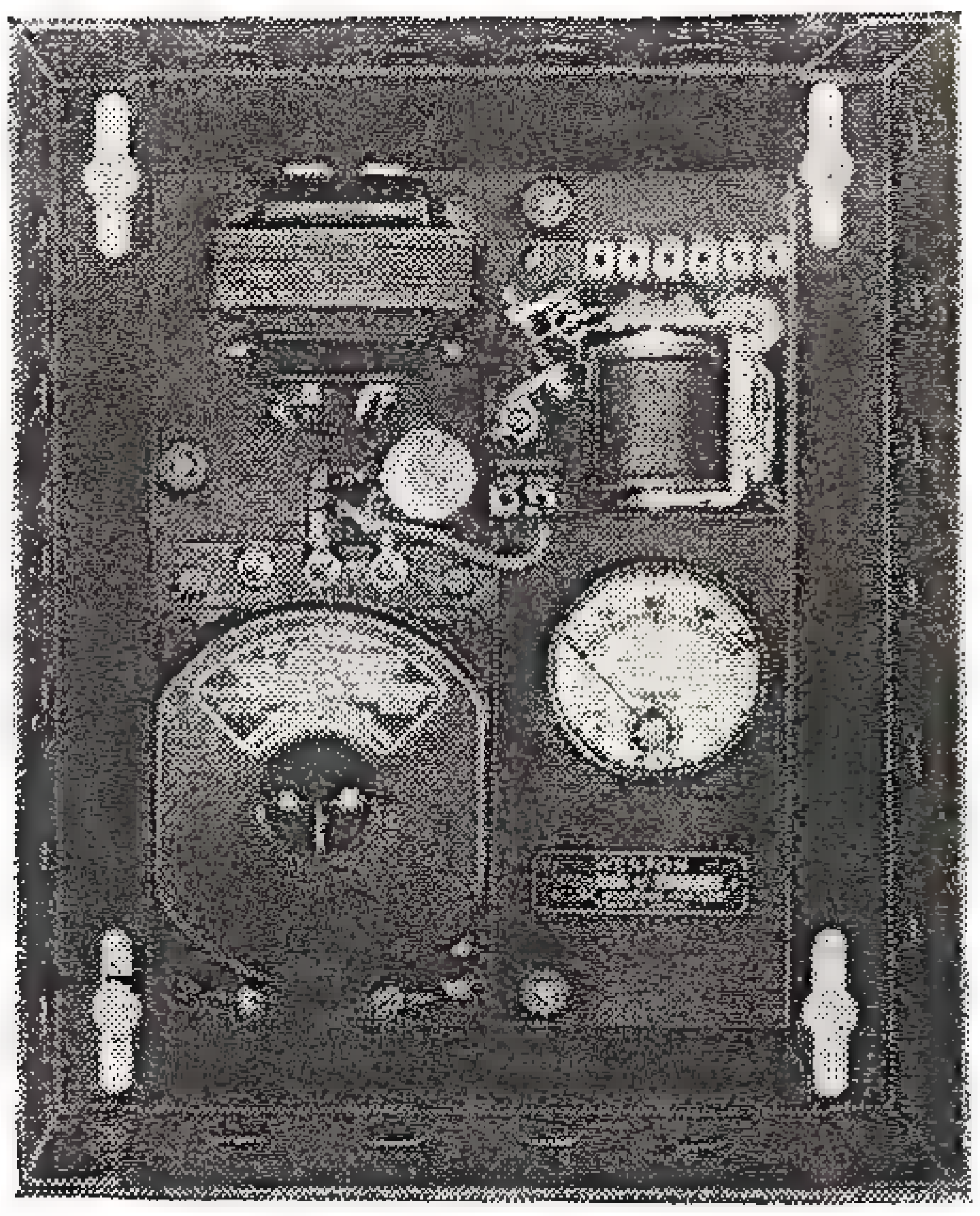

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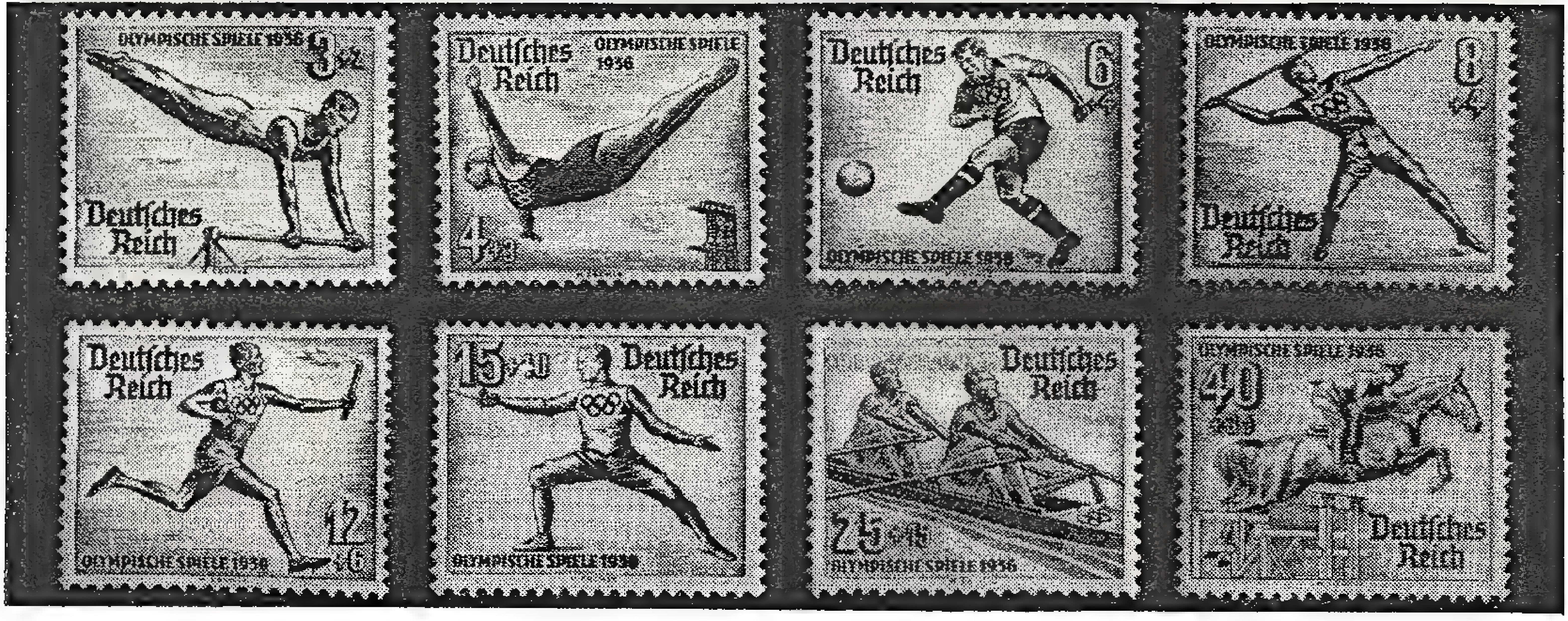

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Tackle Suggestions For Bass Fishing

[*Continued from page* 137]

times that of the rod. Thus if the rod should weigh 5 ounces the reel, to balance properly, should have a weight of 7½ ounces. Because automatic reels can be obtained in these weights, is another point scored in their behalf.

Fly rod fishing for bass, having become little short of a national institution, and being practiced everywhere, has brought on a host of lures especially fitted for this rod and method of casting. In this department are found a number of lifelike lures of a small nature, bass bugs with cork bodies, bass flies and flies in combination with a spinner on a shaft. All of these are effective, each type of which has its devotee. Of the two types, the bass bugs and the fly-and-spinner combination are the two outstanding and universally effective ones. Nor should the various bucktail and squirrel hair flies, as used in small mouth bass fishing, be left out in the cold; or certain feather minnows that sometimes have the effect of bringing forth the finest old bass in the river.

Plug Lures Divided Into 3 Classes

The lures used in bait casting are, of course, heavier. Mostly they are plug lures that range in weight from ¾-ounce on up to an ounce and a half. They are divided into three classes, namely, the underwater minnows that have a weighted body that stays deep in the water; the surface-and-sub-surface lure, which floats when not reeled, but which dips under when set in motion; and the strictly top-water lure, that clings to the surface all of the time.

Spinners and metal lures in many varieties have proved effective in bait casting. Bucktail lures that are weighted, and have a spinner with them are especially useful in river fishing. A spinner on a shaft and a frog often proves taking when other lures fail. Wobbling metal lures are exceedingly attractive. The pork-rind lures, in many varieties, belong in a class so prominent and so deadly in taking bass that they simply cannot be left out of the tackle box. Three or four specimens of various rind lures should be in every bass fisherman's tackle box!

Don't Select Too Light A Line

For the casting of fly rod lures with the bass fly rod the enameled (not oiled silk) lines are used. A common failing is the selection of a line that is too light. A heavy line will cast much better, hence a size C or D enameled line will give the best of service.

While pork-rind lures and other like attractors, being light in weight, cast with greater ease when handled on a soft braided line, the 18-pound hard braid also does as well. One reason why most fishermen select a hard braid in bass fishing is because all too often in such fishing a possible heavy-weight in the muskellunge or pike division will seize the lure. A durable line is then equal to a capture!

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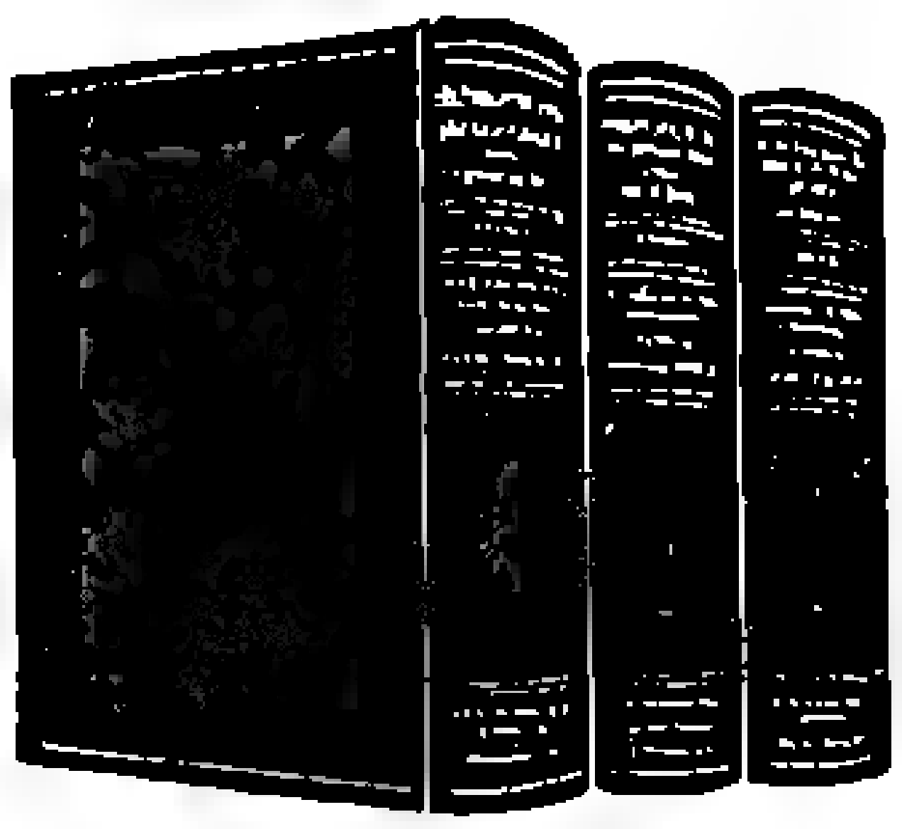

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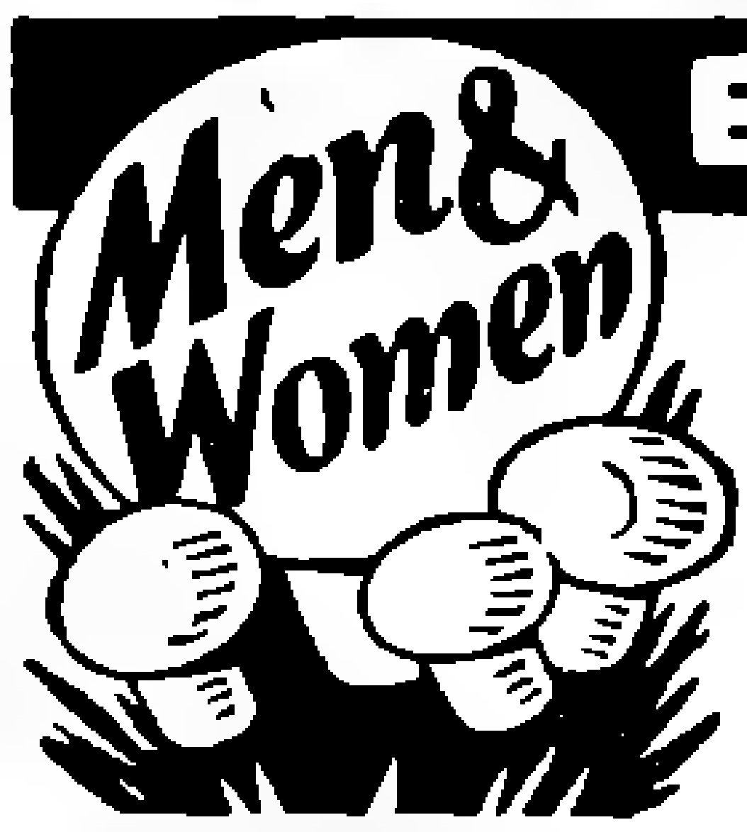

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Whirling Funnels Spread Disaster

[*Continued from page* 54]

There is no regularity about visitations of tornadoes. Most places have never been known to be hit; but the town of Codell, Kansas, was struck three times in three successive years, 1916, 1917 and 1918, and was close to the beginning of a tornado in 1915. Each time the tornado occurred on May 20 and at almost the same hour of the day. The last time, the town was practically wiped out. People there almost acquired the habit of keeping close to their caves and basements when May 20 rolled around, but the town has not been struck since.

Chicago has had not less than three tornadoes. St. Louis has experienced two outstanding disasters, in 1896 when the loss was $12,000,000, and in 1927, when the loss was twice as great.

Omaha, Neb., Louisville, Ky., Minneapolis, Minn. and Philadelphia, Pa., each have been struck twice by tornadoes, at least one of which was quite destructive at each place. St. Joseph, Mo., had four tornadoes in 14 years ending with 1927, while the Kansas Cities have been struck twice.

Gainesville, Ga., had been struck twice before by tornadoes; and there were two tornadoes or groups of tornadoes there last April 6—one at 8:27 a. m. and one ten minutes later.

Tornadoes usually travel toward northeast, and most commonly form in the late afternoon; but they have been known to approach from almost every direction, and their paths are often far from straight lines. They may occur at any hour.

Conditions that favor tornadoes are warm, "sticky" mornings, especially between March 15 and June 15, over an area located to the southeast of a center of low atmospheric pressure, the familiar "Low" of the weather map.

No system has yet been devised for warning communities of the approach of a tornado. As the storm strikes, communication facilities are usually destroyed instantly, and everyone thrown into confusion by an occurrence that is seldom experienced more than once in a life time. Besides, at the time there is little opportunity to ascertain in what direction the storm is moving, and no way of knowing how far it will travel. A few instances are known where warnings have been telephoned to persons nearby as a tornado has moved across open country.

One of the safest refuges from a tornado is a storm cave or "cyclone cellar," common to the dry plains country, where it is used to store fruit and vegetables. Next to this, the basement of a frame house, crouching along the wall on the side from which the storm is approaching, usually the southwest corner, is a popular and safe refuge. The basement of a brick house is to be avoided on account of danger from falling walls; but the first floor of a brick or modern steel reinforced building, close to an inside wall or pillar, is preferable to upper stories. Stay away from windows in such a case, as the air will be filled with flying debris.

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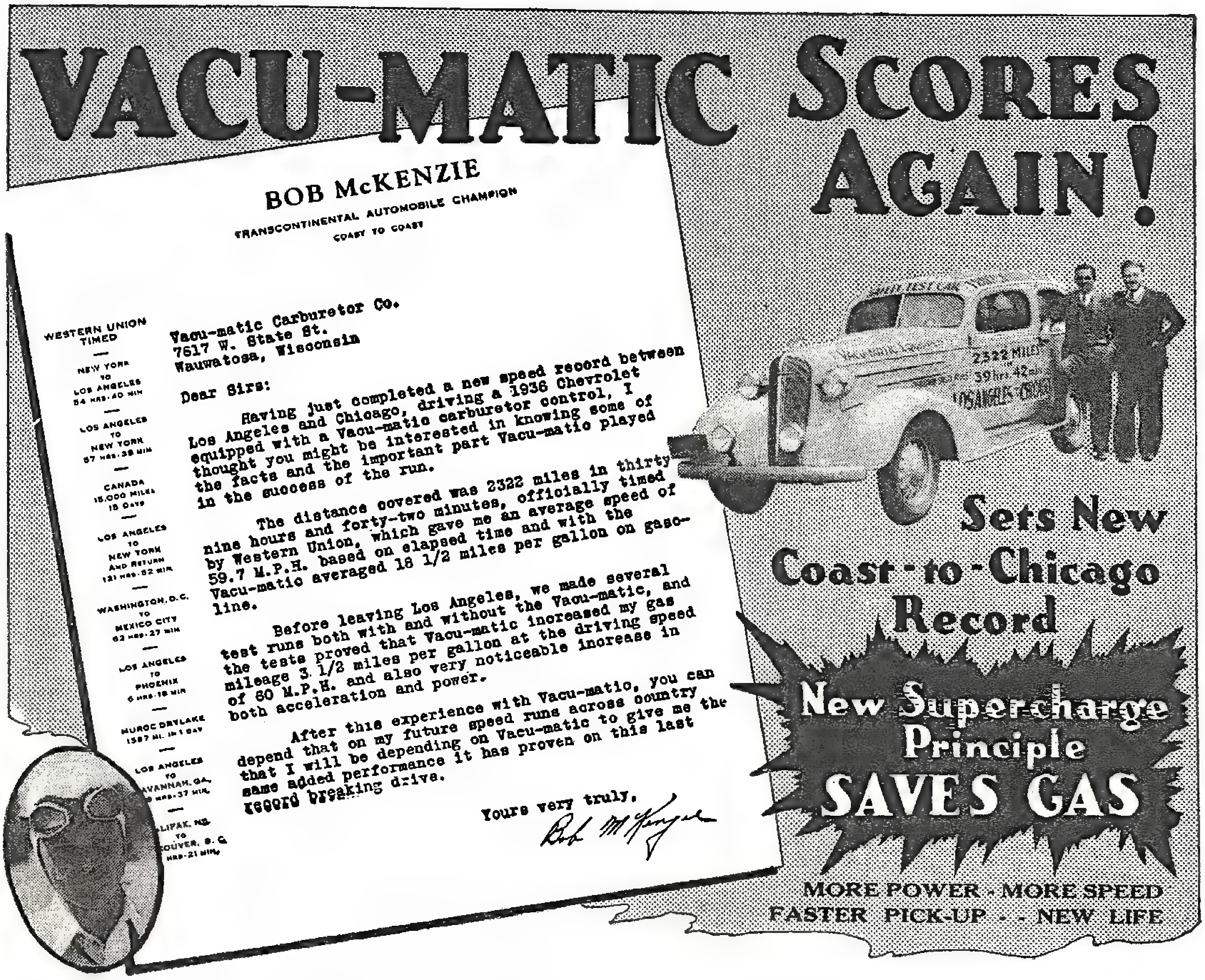

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Vacu-matic is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

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VACU-MATIC offers a splendid opportunity for unusual sales and profits. Valuable territories now being assigned. Check and mail coupon.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and *sealed at the factory*. Nothing to regulate. Easily attached in ten minutes.

The VACU-MATIC Co. Wauwatosa, Wis.

Guaranteed Gas Savings

VACU-MATIC must prove itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up and more power, or it costs you nothing. "On my V-8 Ford it works miracles", says Ralph Fields. James Seeley —"On an International Truck on a round trip to Cleveland, 385 miles, it saved 19 gallons of gas." A. V. Grove —"On the Buick it showed 5 miles more per gallon." F. S. Peck—"I average 22 miles per gal. on my Plymouth, an increase of 7 miles, for a saving of $15.00 a month, or $180.00 a year." Wm. Lyons—"Averaged 25 miles on a gal. with a Model A Ford at 40 miles per hour."

Free Details

You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

FREE OFFER COUPON

THE VACU-MATIC COMPANY
7617-233 W. State St., Wauwatosa, Wis.

Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

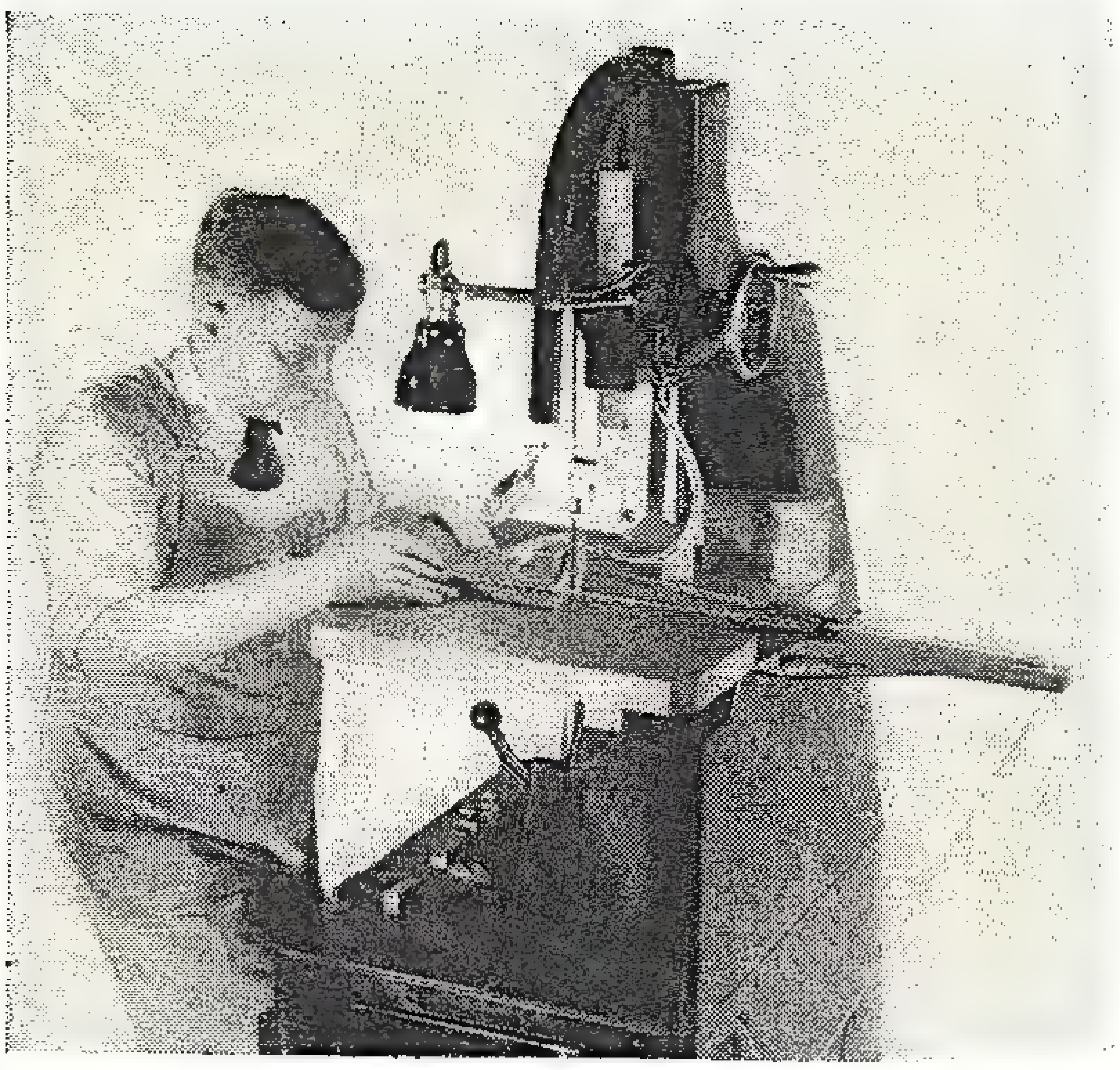
Name ....

Address ....

City .... State..............

☐ Check here if interested in selling proposition.

New Ideas Meet Changing Business



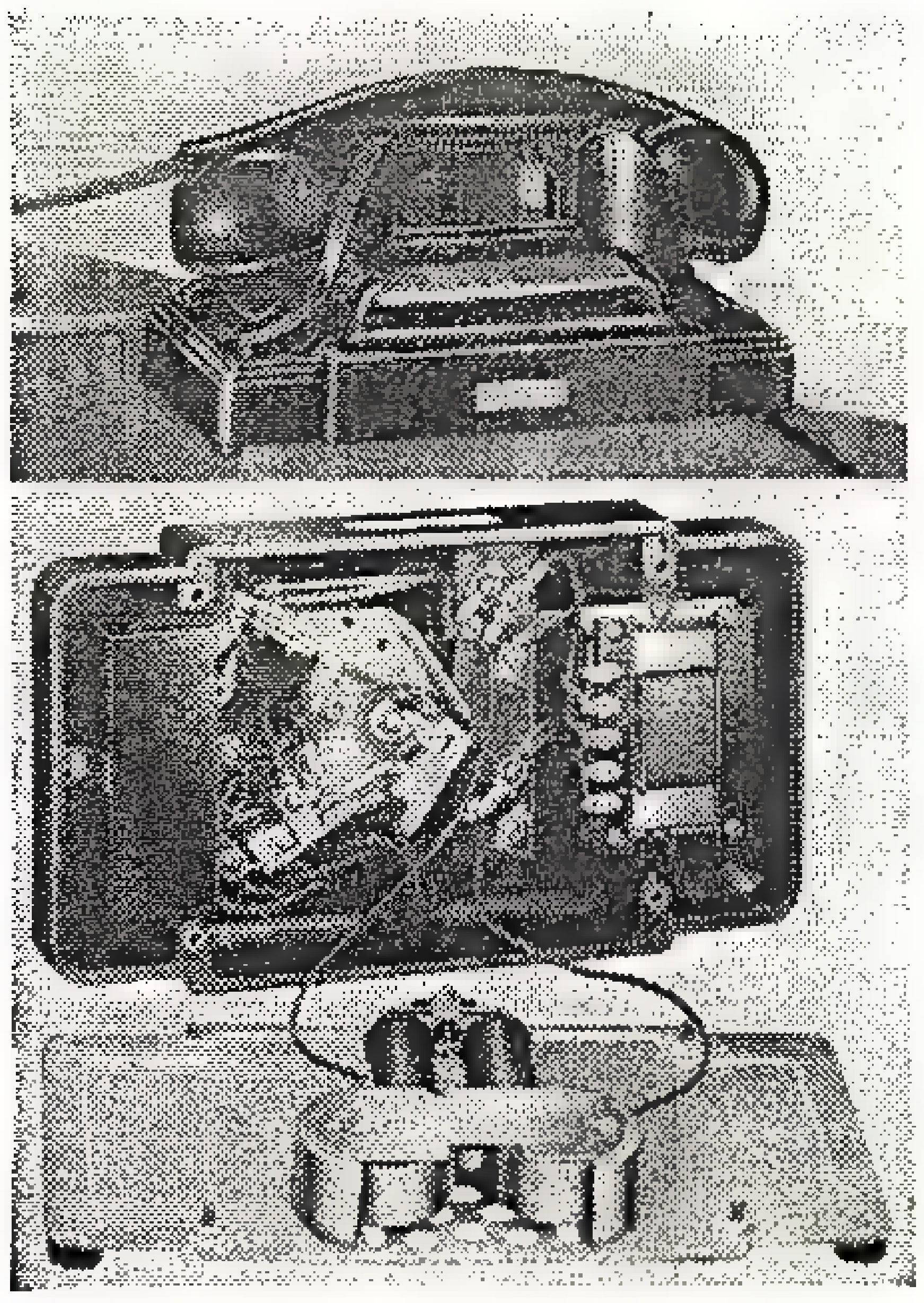
A magnifying glass for fine work, a power work feed to keep a constant pressure on heavy work, and a circle cutting table are new features of this versatile power machine. Work feed has a spring motor; pressure is controlled by a foot pedal.

A synthetic resin, produced by chemical reaction, can be used as an adhesive base for plywood, in plastics, dyeing, or as sizing. New uses are sought by the inventor.

A coin and slug sorting device for coin operated vending machines side-tracks slugs before they can reach the mechanism.

A rubber impregnated paper is pliable, tough and waterproof.

A motor-driven lawn mower, weighing but 95 pounds, has free-wheeling, automatic start and stop, four cutting heights, speed governor, and uses but a gallon of gas a day.



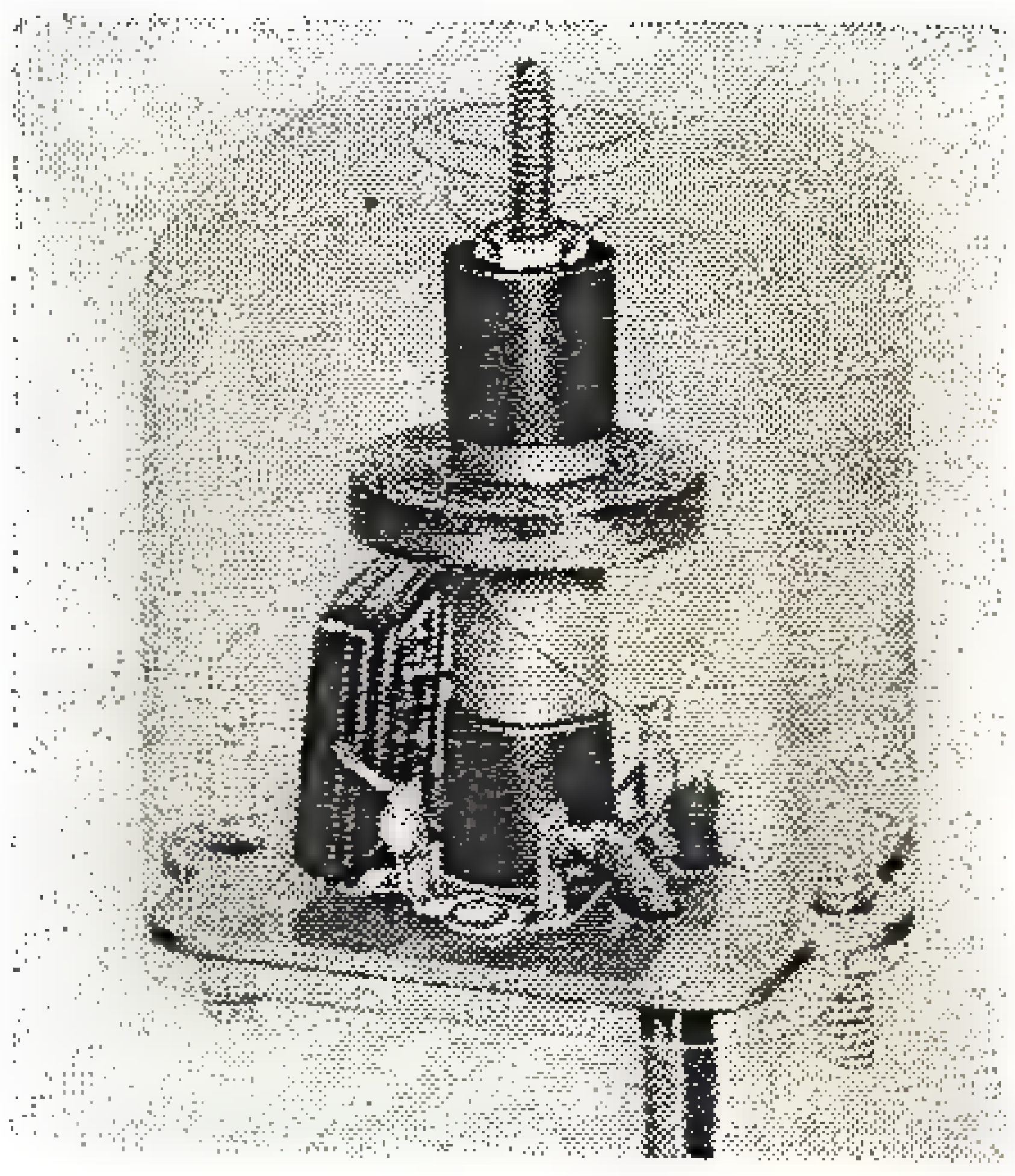
This new French type phone contains coil, condenser and ringer in its streamlined base. No extra wiring or desk box is necessary.

A new type sales letter includes envelope, display advertising, and business reply envelope on a single sheet of paper.

A remote control unit for operating doors, alarms or signal bells, goes into action when a person or car approaches within three feet of its 50 to 100-foot antenna.

An air conditioner for individual rooms requires no extra plumbing or electrical work.

A new pocket knife has blades which open at the push of a button on the grip.



This wave trap, tuned by a movable magnetic core, prevents interference from ship-to-shore stations.

An intermediate frequency transformer furnishes unusual selectivity and simplicity in receiver balancing on super-hetrodyne sets.

A radically new spot remover has a brush in the container top to simplify cleaning work.

A sports shoe for soft ball players has detachable cleats, making the shoe available for other sports.

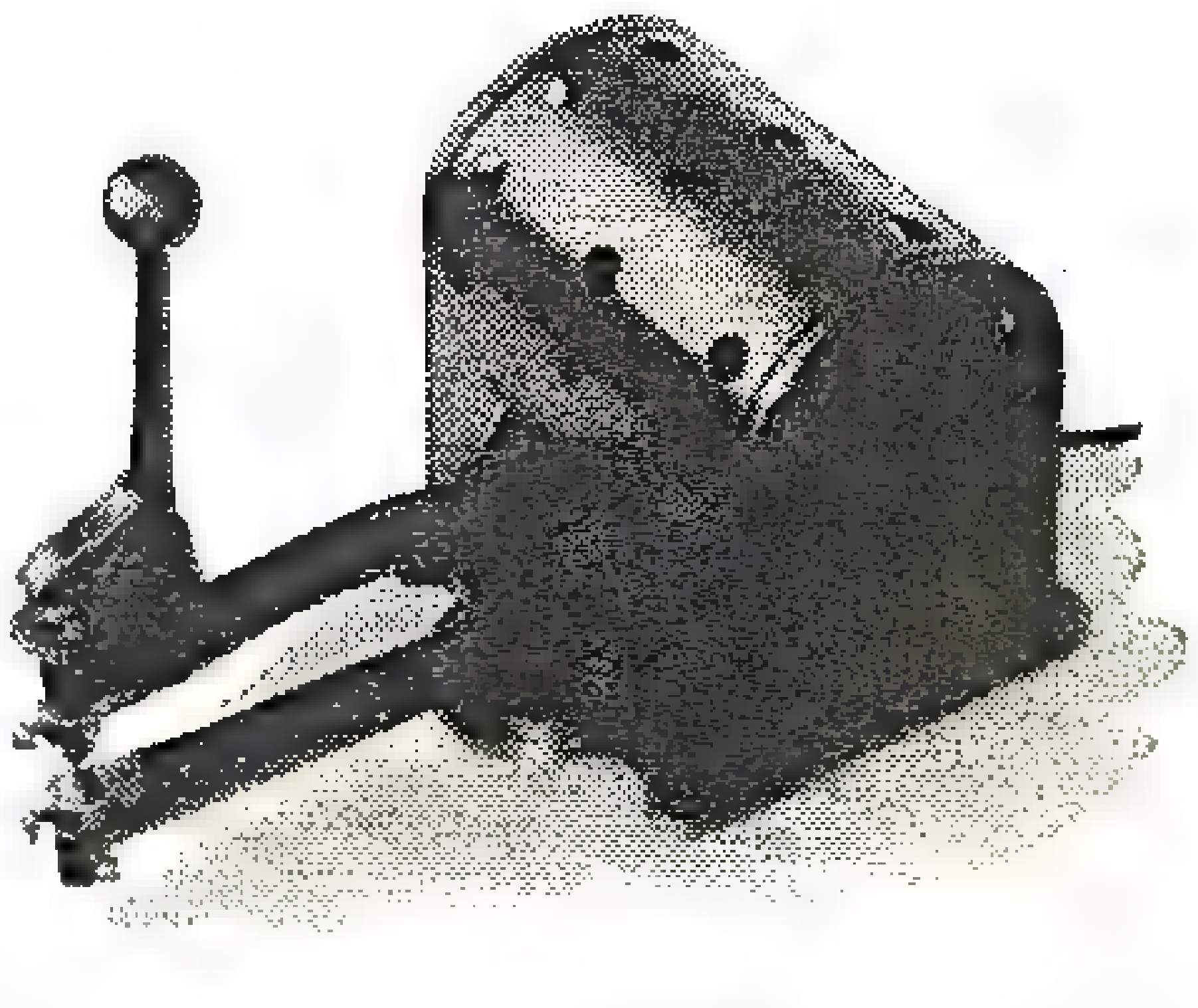
A metal priming paint is water, oil and acid resistant and dries in 24 hours.

Asphalt shingles, reversible, self-spacing and self-aligning, are now available.

A berry picker's wrist guard also serves as a container into which berries can be dropped.

An asbestos mitten with woven wool lining withstands terrific temperatures.

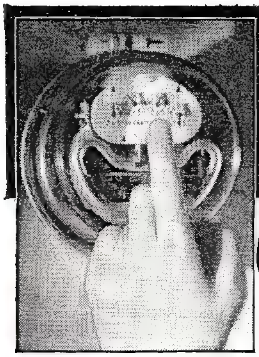
A typewriter eraser consisting of a mineral fiber brush in a molded plastic case quickly removes ink from bond or ledger paper.



Materials up to ¼-inch can be welded on this low-cost electric spot welder. It is designed for home craftsmen, sheet metal shops, service men and school shops.

Editor's Note—Addresses of manufacturers of these and other new products in this issue can be obtained by sending a stamped, self-addressed envelope to MODERN MECHANIX HOBBIES & INVENTIONS, *Information Bureau, Fawcett Building, Greenwich, Connecticut. Manufacturers are invited to submit material.*

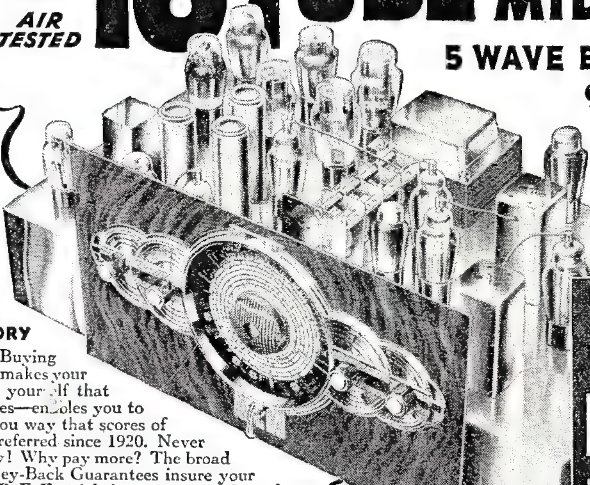
Exclusive New MIDWEST ELECTRIK-SAVER *Slashes Radio Current Bills* IN HALF!



NEW 1937 *AIR TESTED* 16-TUBE MIDWEST

5 WAVE BANDS

9 *to* 2,200 METERS



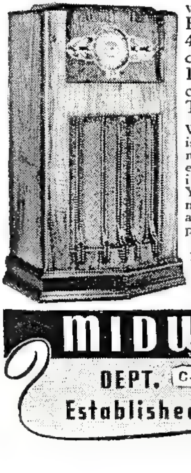
The Electrik-Saver is today's most sensational radio feature. It cuts radio wattage consumption as much as 50% and results in Midwest 16 and 18-tube radios consuming no more current than an ordinary 7 or 8-tube set. This feature enables the "Air Tested" Midwest to operate on low line voltages—as low as 80 volts! In addition, the Electrik-Saver increases tube life, reduces strain on the set, eliminates repair bills and makes for more consistent and gloriously realistic reception.

SAVE UP TO 50%

DIRECT FROM MIDWEST FACTORY

NO middlemen's profits to pay! Buying direct from the Midwest factory makes your radio dollar go twice as far. See for yourself that Midwest offers you greater radio values—enables you to buy the more economical factory-to-you way that scores of thousands of radio purchasers have preferred since 1920. Never before so much radio for so little money! Why pay more? The broad Midwest Foreign Reception and Money-Back Guarantees insure your satisfaction. You get 30 days FREE trial in your own home!

Once again, Midwest demonstrates its leadership by offering the world's most powerful and most beautiful ALL-WAVE 16-tube, 5-Band Radio. A startling achievement, it makes the whole world your playground. Powerful Triple-Twin tubes (two tubes in one!) give 18-tube results. This advanced radio is a master achievement, a highly perfected, precisely built, radio-musical instrument that will thrill you with its marvelous super performance . . . glorious crystal-clear "concert" realism . . . and magnificent foreign reception. The Dual Audio Program Expander gives a living, vital realistic quality to voice and musical reproduction. Before you buy, write for the FREE 40-page four color 1937 catalog TODAY.



85 ADVANCED 1937 FEATURES

This Super DeLuxe Midwest is so powerful, so amazingly selective, so delicately sensitive that it brings in distant foreign stations with full loud speaker volume on channels adjacent to powerful locals. Scores of marvelous Midwest features, many of them exclusive, make it easy to parade the nations of the world before you. You can switch instantly from American programs . . . to Canadian, police, amateur, commercial, airplane and ship broadcasts...to the finest and most fascinating foreign programs. The new Midwest Tuning System, for example, shows you exactly where to tune for foreign stations . . . while Automatic Aerial Adaption triples the number of foreign stations that can be secured and doubles the excitement and joy of short wave tuning.

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With a Midwest, the finest entertainment the world has to offer is at your command. It is preferred by famous orchestra leaders, musicians, movie stars and discriminating radio purchasers everywhere. It enjoys an increasing world-wide sale because it outperforms ordinary receivers costing twice as much. You can order your Midwest "Air-Tested" radio from the new 40-page catalog with as much certainty of satisfaction as if you were to come yourself to our great factory. (It pictures the beautiful 1937 radios . . . in their actual colors!) You pay as little as 10c a day. Three iron-clad guarantees protect you: (1) A Foreign Reception Guarantee—(2) Absolute Guarantee of Satisfaction — (3) One-Year Warranty. Fill in and mail the coupon NOW!

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Glen Gray

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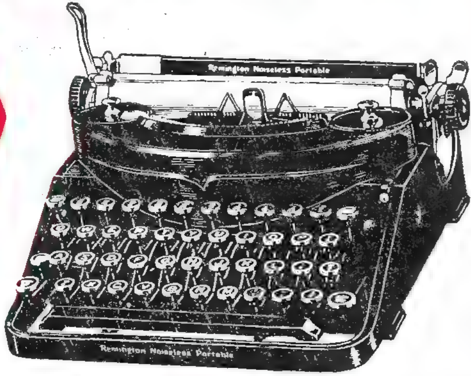

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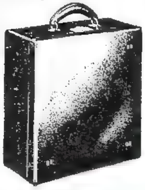
FREE → TYPING COURSE

Touch
REMINGTON TYPEWRITERS

With your New Remington Noiseless Portable we will send you—absolutely FREE—a 19-page course in typing. It teaches the Touch System, used by all expert typists. It is simply written and completely illustrated. Instructions are as simple as A, B, C. Even a child can easily understand this method. A little study and the average person, child or adult, becomes fascinated. Follow this course during the 10-Day Trial Period we give you with your typewriter and you will wonder why you ever took the trouble to write letters by hand.

FREE → CARRYING CASE



Also under this new Purchase Plan we will send you FREE with every Remington Noiseless Portable a special carrying case sturdily built of 3-ply wood. This handsome case is covered with heavy du Pont fabric. The top is removed by one motion, leaving the machine firmly attached to the base. This makes it easy to use your Remington anywhere—on knees, in chairs, on trains. Don't delay . . . send in the coupon for complete details!

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GREATEST TYPEWRITER BARGAIN IN 10 YEARS

The gem of all portables. Imagine a machine that speaks in a whisper . . . that removes all limitations of time or place. You can write in a library, a sick room, a Pullman berth without the slightest fear of disturbing others. And in addition to quiet is a superb performance that literally makes the words seem to flow from the machine. Equipped with all attachments that make for complete writing equipment, the Remington Noiseless Portable produces manifolding and stencil cutting of truly exceptional character. Furnished in black with shining chromium attachments. Mail coupon today!

SPECIFICATIONS. Standard Keyboard. Finished in glistening black with chromium attachments. Takes paper 9.5 inches wide. Writes lines 8.2 inches wide. Standard size. 12 yard ribbon. Makes up to 7 clear, legible carbons. Back spacer. Full size platen. Paper fingers, roller type. Black key cards with white letters. Double shift key and shift lock. Right and left carriage release. Right and left cylinder knobs. Large cushion rubber feet. Single or double space adjustment. All the modern features plus NOISELESS operation.

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INVENTORS NOTE:

★ You may not be an Edison or a Kettering but still you may have a good idea ★

TO BE successful as an inventor, you don't need to be an Edison who took out 1099 Patents before he died, or a C. F. Kettering, who helped develop the Self-Starter, Duco, Ethyl Gas, and other outstanding inventions, and is today the famous head of the Research Division of the General Motors Corporation. In fact, you don't need to be known as an inventor at all, if you have a practical, useful, salable invention—or an idea for one—**and go about it right.**

Remember that for every Edison or Kettering, for every McCormick, DeForest or Atwater Kent—there have been thousands of unknown men whose inventions helped along the wheels of progress and helped the inventors financially at the same time.

Many Little Ideas Have Big Commercial Possibilities

For example, who knows the name of the inventor of the wooden golf tee, the ordinary crinkly hair pin, or the metal ball or disc that the average housewife uses for scouring pots and pans? Who knows the inventors of the thousands of gadgets that you will find in the ten-cent stores, in the modern drug and department stores? Some day, stop and look at some of the simple articles you'll find on the counters of a ten-cent store. Notice how many of them are marked Patented or Patent Applied For. It is an interesting, educational experiment. These inventors, most of them, weren't of the genius class. They simply got an idea for doing something in a better, easier, faster, or more economical way—AND THEN DID SOMETHING ABOUT IT.

Interesting Points

Who is today's "champion inventor"?

Ans.: John F. O'Connor, of Chicago, Ill., holds 949 Patents, more than any other living man.

Who is "Lady Edison"?

Ans.: Miss Beulah Louise Henry of New York City leads all women inventors, holds fifty patents; is known as "Lady Edison".

What is an Improvement?

Ans.: Nearly all inventions today are improvements over earlier inventions. Often the improvement proves more profitable than the earlier invention.

Is a model necessary?

Ans.: Today, most inventions are patented without models. A subject fully explained in our book.

What is the preliminary search?

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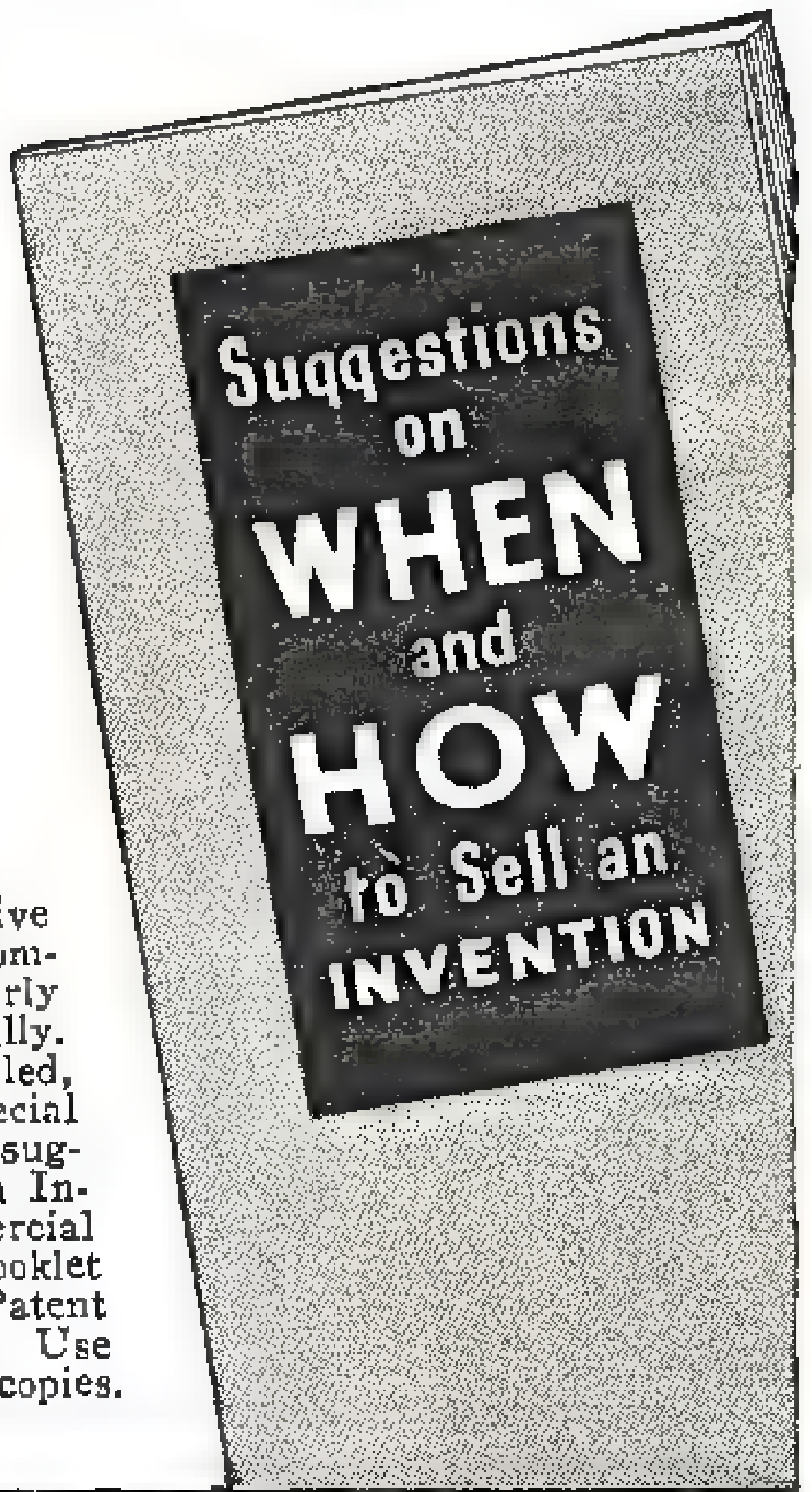
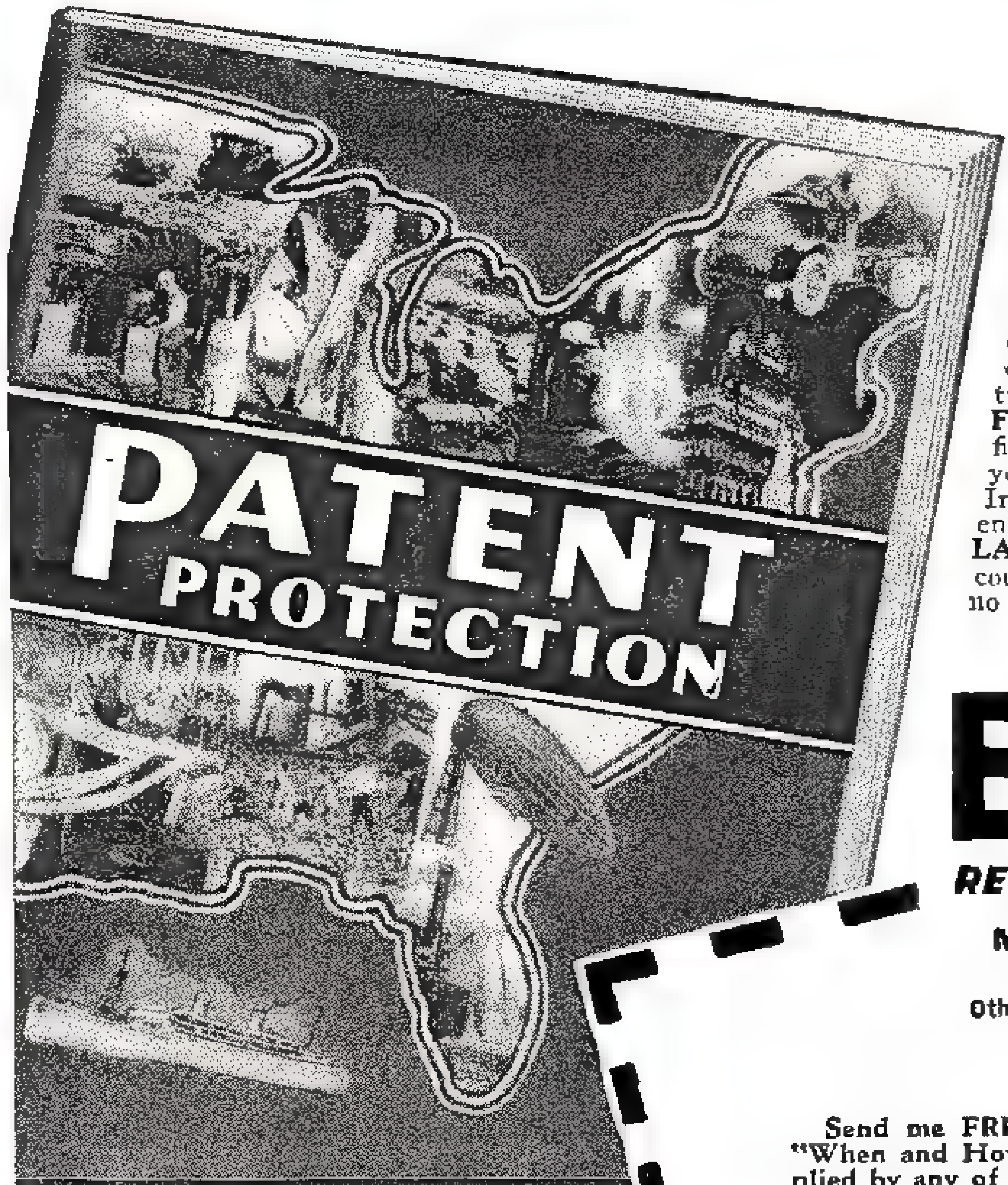
There are two sides to every inventive success: The inventive side and the commercial side. A good invention poorly handled, can prove a failure commercially. An ordinary invention, properly handled, can be made a money-maker. In the special booklet, shown here, we give you some suggestions on "When and How to Sell an Invention"; practical hints on the commercial side of inventing. We'll send this new booklet along with the big 48-page book, "Patent Protection" illustrated on the next page. Use the convenient coupon to request your copies.

You may be able to do as well as others who have been successful. That only time can tell. But there is one thing you can do, **and do now,** without waiting on time. You can find out easily and quickly **exactly what to do to protect yourself.** In the 48-page book, "Patent Protection" shown on the opposite page, which will be sent to you FREE, we tell you what many other inventors have done, just what you yourself must do to make Application for a Patent, give you interesting facts about inventive history, show you 115 mechanical movements that inventors have used in working out ideas, and **much more.** Decide now to get a copy of this interesting book. Its facts can be worth much—**yet they cost you nothing.**



We Cordially Invite You to . .

YOUR QUESTIONS ANSWERED! There are a lot of questions that the average man with an invention, or an idea for one, wants answered before he goes ahead. Here are a few of them that most inventors put up to us: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the **first** man to think of **my invention**? Is a Patent worth the cost? Should I try to sell **my** invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been Patented? These are but a few of the questions which usually confront the average man. **You need the answers! YOU CAN HAVE THEM, without cost, trouble, or delay.**



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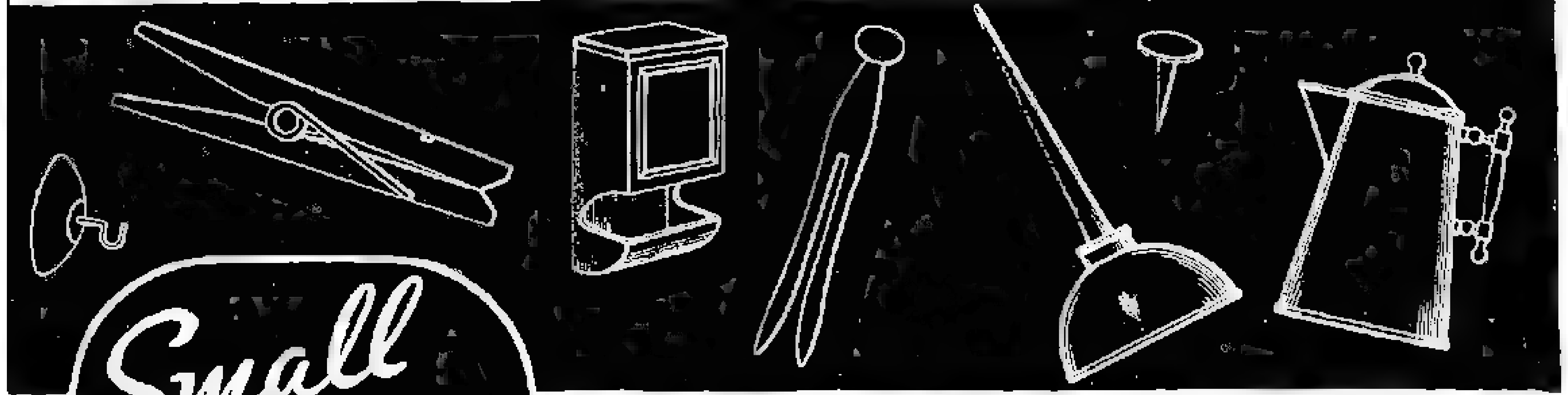
INVENTORS



Small Ideas THAT HAVE BUILT BIG BUSINESSES

IDEAS do not have to be complicated to be profitable when Patented. The 5c and 10c stores flourish on simple Patented products which are commercially successful. The zipper, safety pin, thumb tack, paper clip, collar button—all simple, yet familiar inventions—brought their inventors rich rewards. If you have a Patentable idea—act to protect it. Many of the most useful, widely popular, greatly profitable, and extremely successful inventions have been very simple ones. You have only to look at the devices we have pictured here to realize how a simple idea may become a utility bought by a hundred thousand or a million people soon after it is produced. Don't be afraid that the simplicity of your idea makes it valueless. The thing that you find so simple that you wonder why a thousand other people haven't already done it is often the invention worthwhile.

HOW OTHER INVENTORS GOT STARTED

The list of men who succeeded in invention with only a poor boy's start is a very long and noble one. Poverty, hardships, lack of friends, distance from the market—these could not hold back Bell, Edison, Eastman, McCormick, Whitney and others. Everyone cannot succeed. But every man can try. Courage, sacrifice, and hard work may bring you a measure of the success these men had. Lack of mechanical ability is not a serious draw-back. You can always get someone able to build a model, draw a detailed design, or otherwise materialize your idea for you. The big draw-back is discouragement.

Your idea for a practical article or an improvement upon an old one should be patented NOW. Frequently many of the thousands of applications filed in the U. S. Patent Office each year are for the same or almost the same idea. In such a case, the burden of proof rests with the last application filed. Sometimes a delay of even a few days in filing the application means the total loss of the patent. LOSE NO TIME.

The entire time of this large and experienced organization is devoted exclusively to patent and trade-mark cases. We know the rules and requirements of the Patent Office. We understand the technicalities of Patent Law. We can proceed in the quickest and safest ways in preparing an application for a patent covering your idea.

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RECORD OF INVENTION

If you have a new idea that is patentable—and want to secure for yourself your inventor's sole right to profit from the idea—you can't afford to lose time in securing the protection of a U. S. Patent. Other inventors may be working on the same idea right now. Should they develop this idea and file patent application before you do—the burden of establishing priority will be upon you. Our Big Book—"Patent Guide for the Inventor"—will tell you the quickest possible way to secure Patent Protection for your idea. SEND FOR IT TODAY!

***The* FIRST IMPORTANT STEP *in* SECURING A PATENT**—is to obtain the services of a Registered Patent Attorney. The U. S. Patent Office advises that you secure the aid of an experienced Registered Patent Attorney to prepare your statements. Establish the date of your invention as explained in our book and disclose your idea to him in correct form. He then makes a SEARCH of the Patent Office Records and reports to you on existing U. S. Patents which might bear on your invention, giving his opinion on the advisability of proceeding and filing formal application.

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Use our FREE "Record of Invention" form to assist you in recording the descriptive outline of your ideas and to establish the date of your invention. With it you can make a rough sketch of your idea and have it witnessed in a manner of value to you as evidence should occasion arise.

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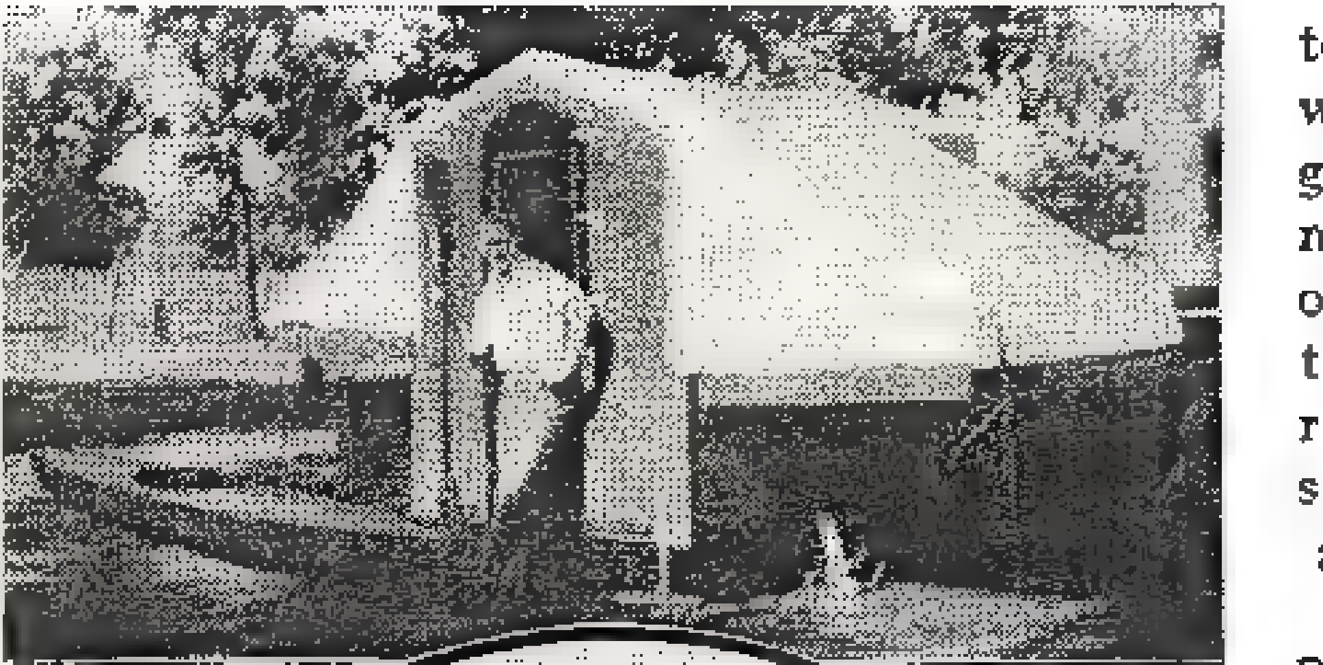
(Please write or print plainly)

Random Chips from the Editor's Workbench



Here are the three prize-winners in this month's Workbench contest. Above are Baby Patches and Patches II, built from plans for Tarbaby and Dorothy respectively by Richard Glenn, winner of the $5 first prize. At top, right is the Bungalow Camp Trailer and Kyack built from MM plans by Walter Buck, second prize winner. In the circle is Tom Gunderson with his Handy Henry tractor. Tom is winner of third prize.

AS WAS predicted in the Workbench last month, this summer is finding more activity among MM readers than ever before. With the home workshop waiting, and good plans to work from, the hot summer days seem to be acting as an inspiration rather than a deterrent in getting projects completed. The letters from our readers being even more eloquent on this subject than we are, we shall start right out with one from Richard Glenn, winner of the first prize of $5 in this month's Workbench Contest.

Selfridge Field, Michigan.

Dear Editor:

May I enter two thoroughbreds? Enclosed find a snap of my Dorothy model sloop and Tarbaby model dingy, Patches II and Baby Patches respectively.

Patches II was built to scale other than being shortened 1½ inches between the frames as I wanted to stay below the three-ton gross law of the Philippine Government where I was stationed. She carried 320 square feet of canvas, the mast was 32 feet in length and rigged with one-fourth-inch galvanized wire. I used about 750 pounds of concrete for ballast inside.

I had a small 1½ horsepower Evinrude two-cycle outboard, about 15 years old, remodeled into an inboard and installed off center on the port side. It gave a speed of close to 5 miles an hour in still water, turning at about 180 R. P. M., which proved that Dorothy needs very little power to move her.

Of course I had to add sufficient keel for enough lateral surface to make her work to the windward very nicely, which she would do unless it got too rough. Owing to her narrow beam at the waterline of course she was rather tender, but with plenty of rudder surface she could be straightened up nicely as soon as she got under way.

As I will be stationed at Selfridge field now I have intentions of building a 27-foot skipjack schooner.

Richard Glenn, Sgt. A. C

Plans for both Dorothy and Tarbaby appeared in the first edition of How To Build 20 Boats, now out of stock, but they can still be obtained in blue print form. In the July issue the discovery of 200 copies of the first edition of How To Build 20 Boats was announced, and two weeks after it reached the stands, they were all gone. However, the plans are all available in blue print form, and are described in the big free blue print booklet. Send a self-addressed, stamped envelope if interested.

***

The second prize letter in this month's contest comes from Walter Buck, of San Luis Obispo, Calif. He writes:

San Luis Obispo, Cal.

Dear Editor:

Having been a subscriber to MM for several years, I feel that we have something in common. I want to say your magazine is one of the best on the market for everyone, and especially those fortunate people interested in various hobbies. Although I am a barber in the daytime, I am an ardent wood-worker at night.

I have constructed many projects from your magazine, the two largest of which I am enclosing pictures. They are a house trailer weighing 1,000 pounds, constructed at a cost of $70, and an Eskimo kyack constructed at a cost of $20.

In a recent issue I saw a trailer constructed from the same plans as mine (Bungalow Camp Trailer), but the total cost was given as $215. There being considerable difference in our costs, I thought you might be interested in our comparison.

Walter F. Buck.

For fast work, Tom Gunderson, of Red Lake Falls, Minn., comes forward to take third prize with his Handy Henry Tractor. Plans for this tractor were published in the July MM, and a month later found Tom with his tractor completed. These three prizes of $5, $3 and $2 respectively are awarded each month to readers sending in the best letters, accompanied by photographs, describing their work with MM projects. The contest is open to everyone. Remember in writing that the editors always want to know which articles you liked most and which you liked least in the current issues of MM. Tom's letter follows:

Red Lake Falls, Minn.

Dear Editor:

Enclosed are pictures of my Model T Ford Tractor. I am very well pleased with what I can do with her. I believe it will last longer than other outfits I have seen, and it cost me only $15.

I did not follow the plans exactly as I used an old Reo transmission in place of the Dodge specified. I did not raise up the rear end, but lowered the front end. I also left the tractor full length of Ford frame but plan to shorten it as well as the front axle. It sure has plenty of power. I put on a box behind to put in sand to give better traction.

Winners of Soapbox Derby Contest

The first prize of a Soapbox racer, complete with a full set of doenut tired wheels, goes to Billie Joe Neil, 309 E. 3d St., Bloomington, Ind. From the letters in the words "Hobbies and Inventions," Billie gathered 2661 words.

Arthur Santmier, 126 Smithfield Road, Woonsocket, R. I., is the winner of second prize, a "trike-wheeled" Soapbox racer. The third prize, a set of four doenut tired wheels, goes to H. B. Baker, Box 242, Morro Bay, Cal.

I like all your mechanical plans but I miss your airplane stuff. I like least the indoor projects.

Tom Gunderson.

***

The old adage that "many hands make light work" is aptly demonstrated by the ever-active Hi-N-Dri Yacht Club of Los Angeles, charter members of the Society of Modern Mechanix and Inventions.

Co-operation is the secret behind the success of their organization, and that they are successful is clearly shown by the following letter from David Forsyth, Commodore:

Los Angeles, Cal.

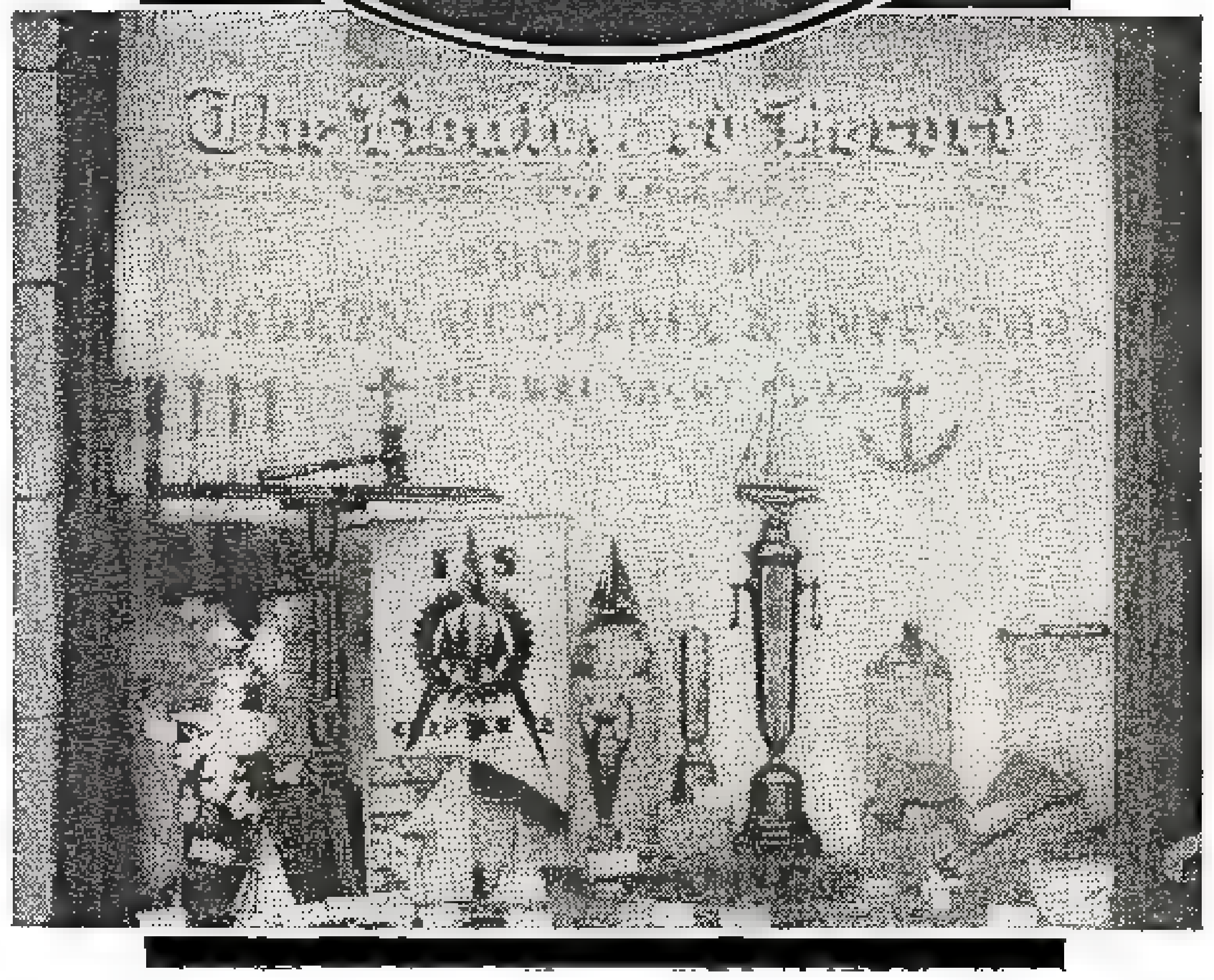
Dear Editor:

Greetings and salutations from Chapter 12, Society of Modern Mechanix and Inventors. We haven't heard much from the other chapters lately but these pictures will show that this chapter is still on its toes and going strong.

The display was placed in one of the windows of our local papers to show the people that besides racing and building boats our members do and make other things. It created a lot of curiosity and interest. The other chapters might use the same idea; publicity never hurts any organization.

This year's officers are: Alex Irving, Vice Commodore;

[*Continued on page* 20]



The Hi-N-Dri Yacht Club of Los Angeles recently staged this exhibit of their workmanship in the window of their local newspaper. Fleet officers for the next year will be left to right, standing, Fleet Captain Albert Holt, and Secretary Wayne Scott. Seated are Vice Commodore Alex Irving, Commodore David Forsythe, and Rear Commodore Robert Butte.

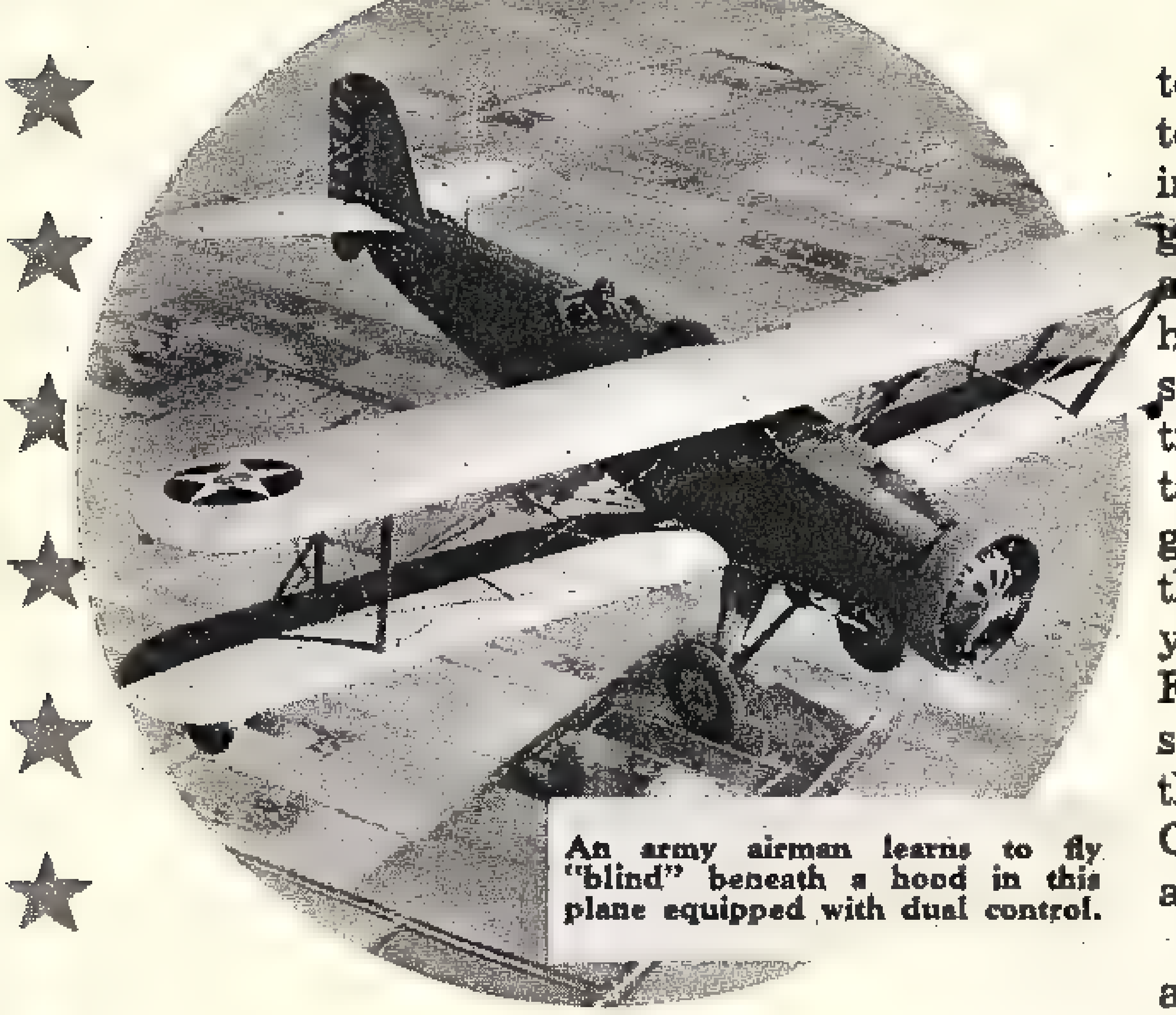
TRAINING ARMY AIR FIGHTERS

If you would fly for Uncle Sam, read this notable article by the Assistant Chief of the Army Air Corps explaining exacting requirements of life at Randolph Field.

by

BRIGADIER GENERAL

H. H. ARNOLD



An army airman learns to fly "blind" beneath a hood in this plane equipped with dual control.

A LARGE percentage of each year's graduates of the West Point Military Academy enter the autumn class at the Air Corps Training Center, Randolph Field, Texas. This fact, and the further fact that the flying school is conducted along lines similar to the Military Academy, has caused this Air Corps school to be popularly termed "The West Point of the Air."

The mission of the West Point of the Air is to turn out young military pilots competent to undertake the duties of second lieutenant in an Air Corps tactical squadron. The organization of the combat squadrons requires a high ratio of young pilots to officers of higher grades. This ratio is maintained by sending each year from 200 to 250 pilots, trained at the Air Corps Training Center to tactical squadrons of the regular army. The graduates of West Point are officers when they enter the flying school but the other young pilots are continued on active duty as Flying Cadets during one year. If their service shows them to be competent, they are then commissioned as second lieutenants, Air Corps Reserve and given a further year of active duty.

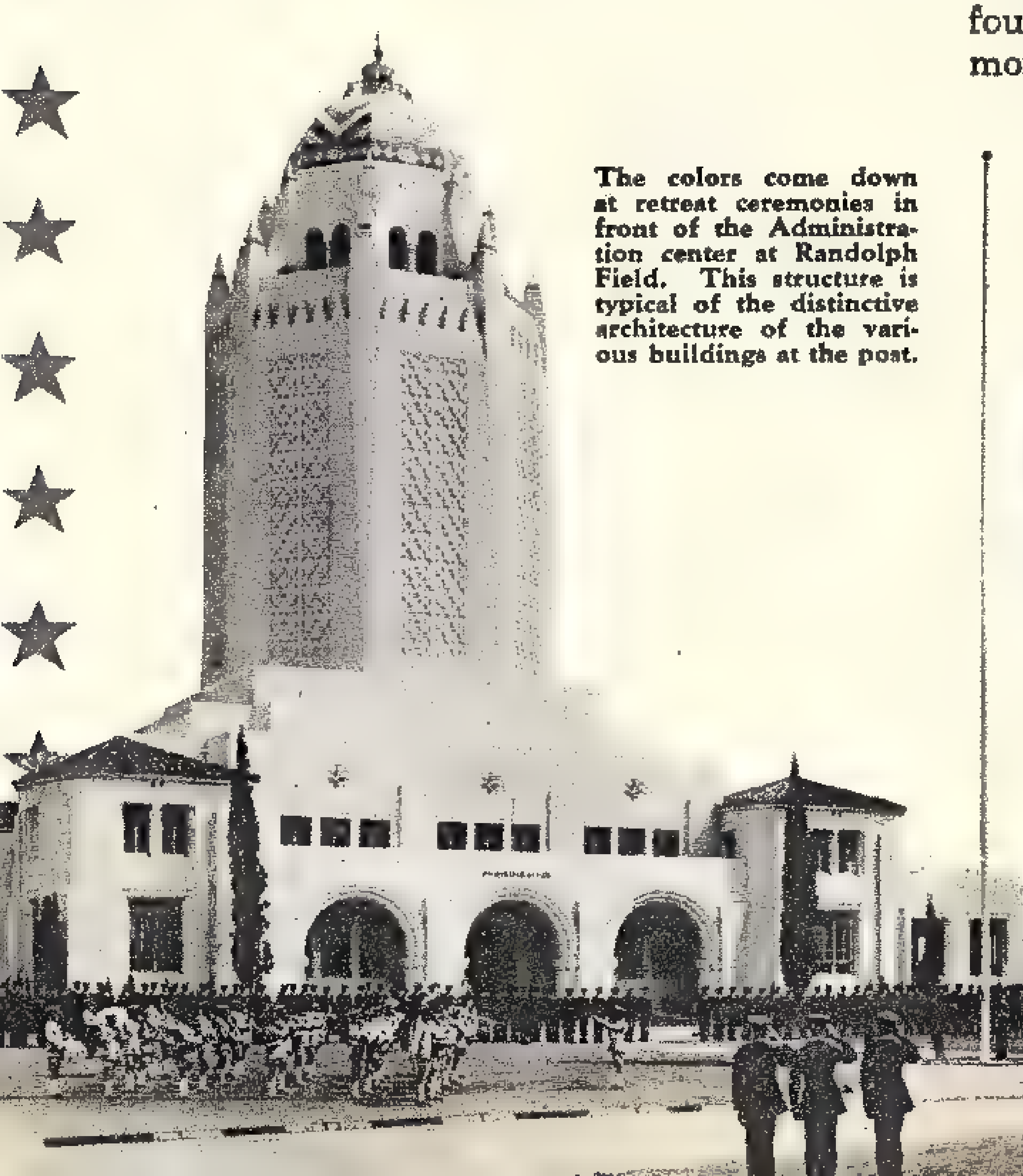
Legislation has been passed recently authorizing the Air Corps to have 1,300 Reserve Officers on extended active duty for periods of five years each. This will enable the selection each year of approximately 270 graduates of the Training Center for duty with tactical squadrons. The proposed law provides for payment, upon discharge from active duty after a minimum of three years active duty, of a bonus of five hundred dollars.

The West Point of the Air is organized to receive new classes at the Primary Flying School every four months. Each class has four months in the "Primary Stage" and four months in the "Basic Stage" at Randolph Field. The "Air Cadets" then move over to Kelly Field for their last four months at the Advanced Flying School, where they are graduated as pilots. During the Primary Stage trainees receive ground instruction and flying instruction on "Primary Training Airplanes" or PT's, as they are known. In the Basic Stage the flying training is conducted in "Basic Training" or BT airplanes, larger, speedier and more maneuverable airplanes. These provide an intermediate step in piloting between the PT's and the service types such as pursuits, bombardment, attack and observation used in the flying training at the Advanced Flying School.

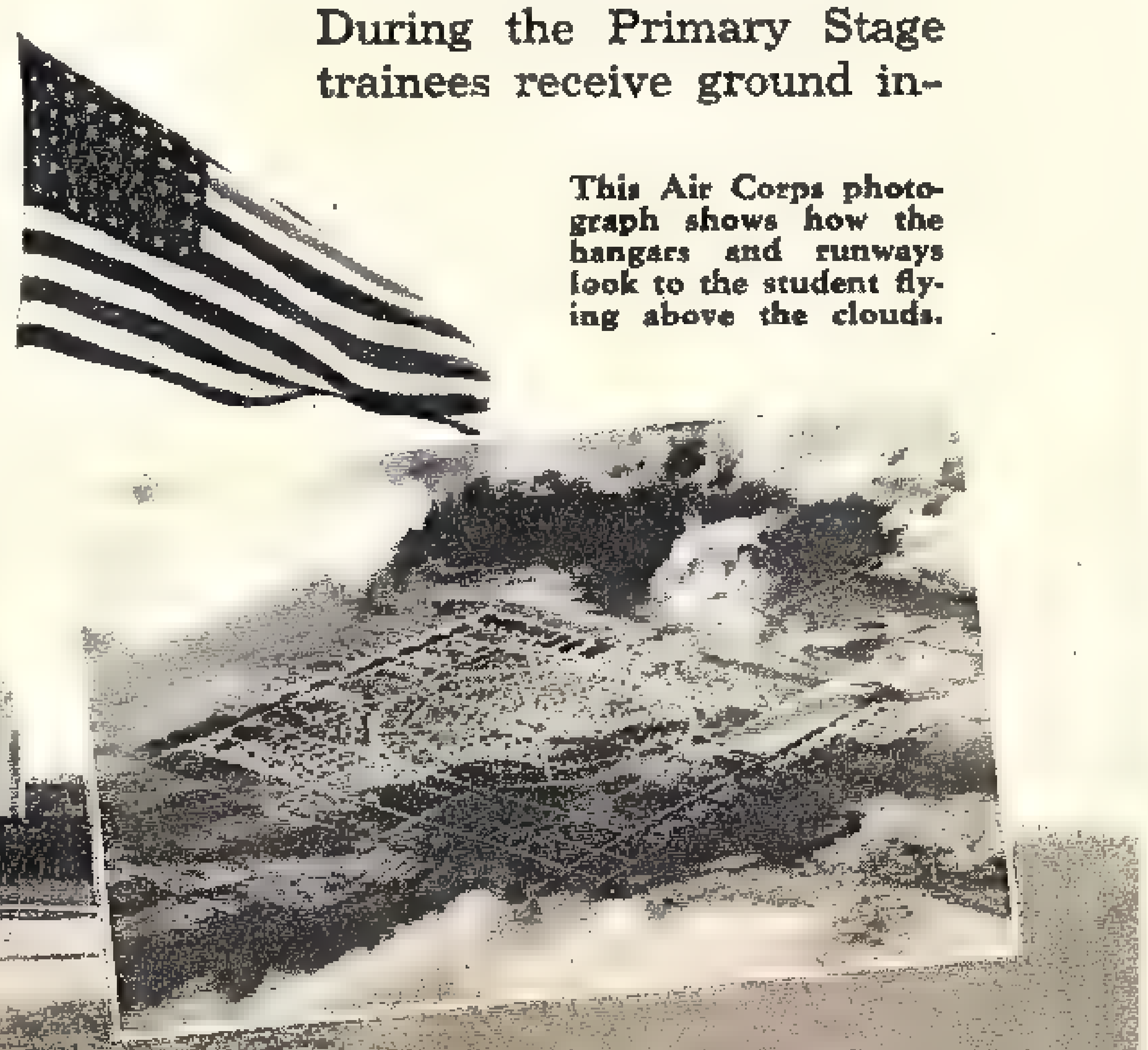
Since a knowledge of the equipment he is flying is essential to the student, and a continuous diet of flying would make a trainee "stale," it is convenient and advantageous to combine with the flight training, ground instruction in airplane engines, theory of flight, radio, ground gunnery, air navigation, meteorology, flight maps, airplane maintenance and other subjects. This ground instruction is continued until graduation. At the Advanced Flying School it emphasizes the tactics of each class of aviation—bombardment, pursuit, attack and observation.

The student body is made up of Flying Cadets and student officers. Each new class consists of approximately 150 men. The class beginning in October of each year usually is composed of from 50 to 80 second lieutenants from the graduating class at West Point. The Flying Cadets in this class therefore are reduced to such number as to make a total for the class of approximately 150. The Flying Cadets, with the exception of a few ex-enlisted men from the army, are drawn entirely from civil life.

In the period of one year at the Training Center the young student receives a total of 323 hours flying instruction. For the fiscal year 1935 the flying for the



The colors come down at retreat ceremonies in front of the Administration center at Randolph Field. This structure is typical of the distinctive architecture of the various buildings at the post.

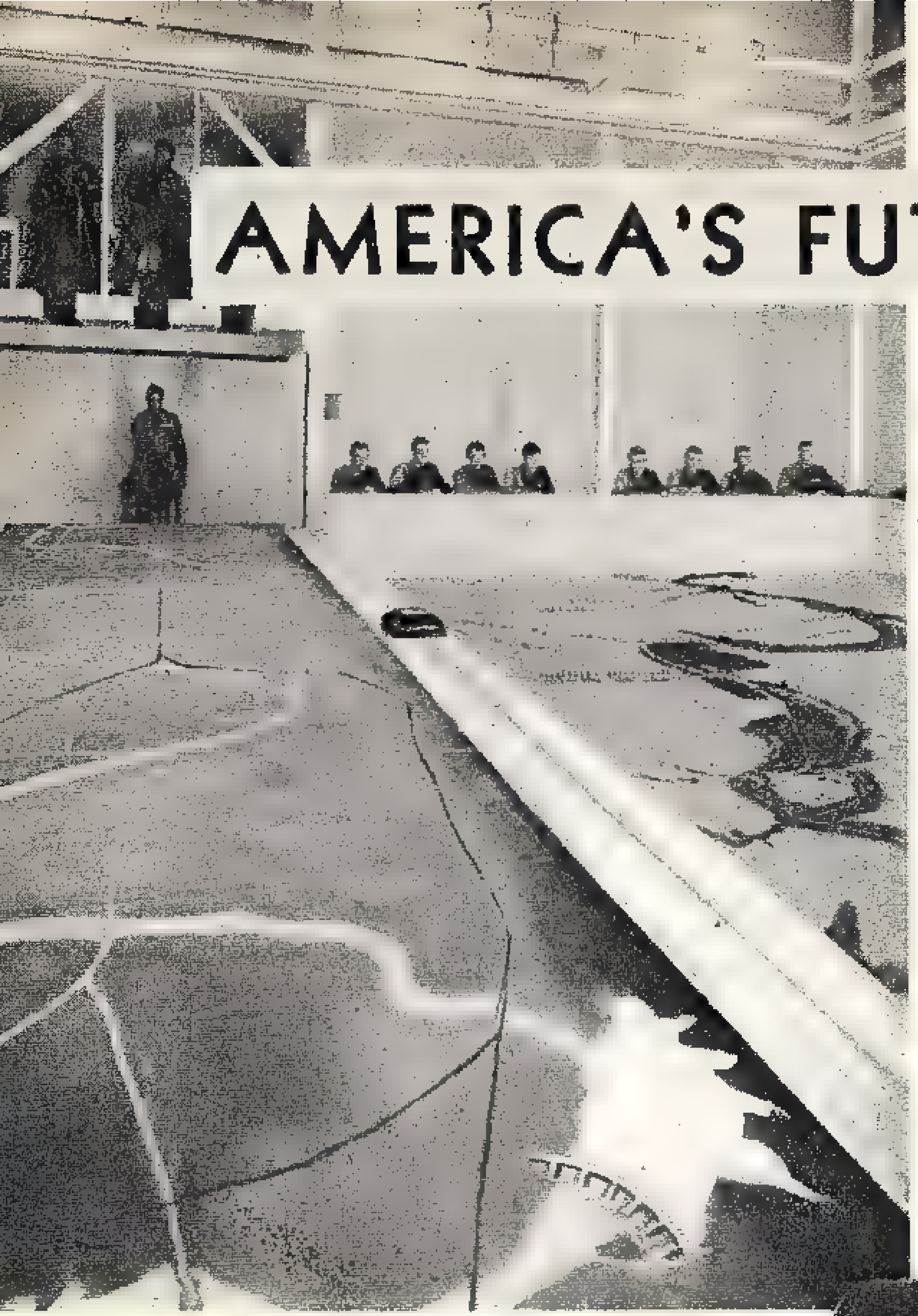


This Air Corps photograph shows how the hangars and runways look to the student flying above the clouds.

Student fliers form an aerial "U. S. A." with their planes over Randolph Field in Texas.

Future Army airmen pictured as they arrive to start instruction at the "West Point of the Air."

AMERICA'S FUTURE ACES STUDY MINIATURE BATTLEFIELDS



Future bombers and artillery observers receive practice on these miniature battlefields. One problem calls for the destruction of the dam.

Training Center, computed in airplane flying time, amounted to 113,802.8 airplane hours. The flying time for the remainder of the Regular Army for the same period was 312,575.4 hours, that of the National Guard 40,606.7 hours, and that of the Organized Reserves 23,204.8 hours.

About 45 per cent of the students entering the Primary Flying School successfully complete the course and graduate from the Training Center. Most of the failures are due to unsatisfactory progress in flying. Therefore, the fact that a candidate has passed the rigid physical and the educational requirements does not insure his graduation. The Training Center, and The Faculty of the School of Aviation Medicine, now, as have many others during the past, are endeavoring to find out, "why can some people fly when others cannot." Is it heredity, physical or mental make up, diet, habits of life, or perhaps our varying inherent fear of high places. Who knows but perhaps they will find the answer some day and say with certainty, "This young man can be taught to fly but this one never will learn."

This Link trainer gives pilots instruction in navigation and blind flying. It turns and pitches in answer to the stick. Cadets study bombs in lower photo.

The Flying Cadets are all young, unmarried citizens, between the ages of 20 and 27, inclusive, of good character, sound physique, and who have had at least two years of college work. If lacking the required educational credentials, they must demonstrate their proficiency by successfully passing examinations in United States history, English, general history, geography, higher algebra, geometry, trigonometry, and physics. The educational equation is simplified for many of these aspirants by their possession of diplomas and degrees from the country's many colleges and universities.

Professionally, these trainees are from all walks of life. Geographically, all states in the United States are represented, with occasional applicants from our various foreign possessions. Students from foreign countries are frequently included in the student officer classification. However, regardless of their former occupations, or their native country, all are trained alike—all live in accordance with the same rules and regulations.

During the interval embraced by the dates of October 15, 1931, and March 1, 1935, a total of 2,022 would-be pilots have reported to the Air Corps Primary Flying School. During that period there were 20 foreign students who came from countries as follows: 7 from Mexico, 2 Brazil, 2 Philippines, 3 China, 2 Turkey, and 1 each from Germany, Guatemala, Cuba and Colombia.

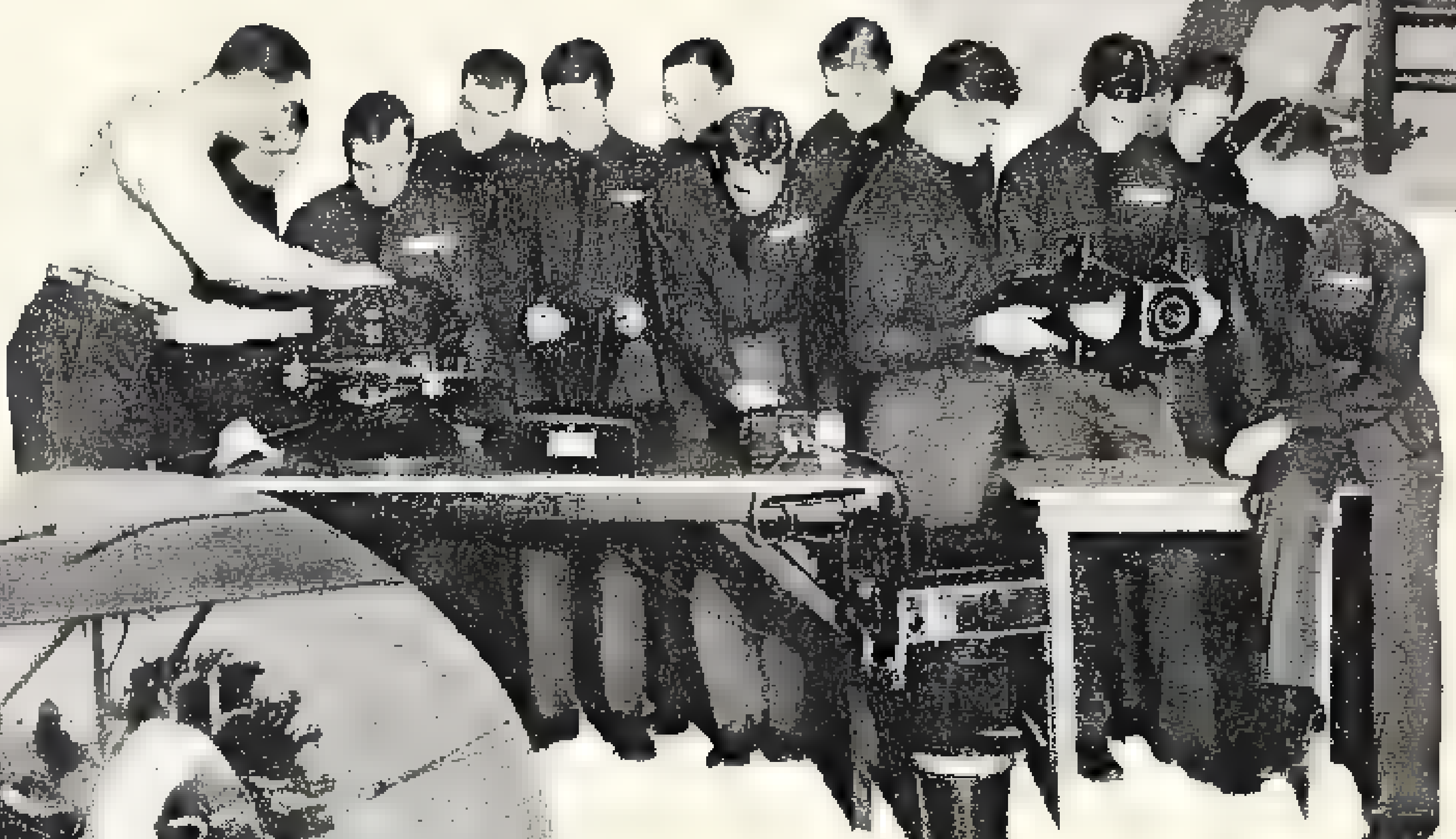
Of the 2,000 cadets who enrolled only five have been killed. This figure deserves especial consideration as it represents the infinitesimal percentage of less than one-half of one per cent of the total number graduated. When compared with similar statistics for training during the war period or with the peace time records of the schools of the armies of other nations, this small proportion is a monumental tribute to the efficiency of the Air Corps training method.

What of the future of the trainee? This answer can be made: Practically all who finish at the Primary Flying School graduate four months later from the Advanced Flying School and following that, the Americans are assigned to Air Corps stations for duty with tactical troops. The Flying Cadet continues in grade for an additional year for seasoning and experience. This is followed by a year, or perhaps two, of active duty as a second lieutenant in the Air Corps Reserve. Upon completion of this period he reverts to his former civilian status, but he may maintain active contact with the service through membership in the National Guard or Organized Reserves. A civilian with this wealth of flying experience behind him, is in a favorable position to seek employment with a commercial aviation company. Then, too, there is the recent possibility

[*Continued on page* 132]

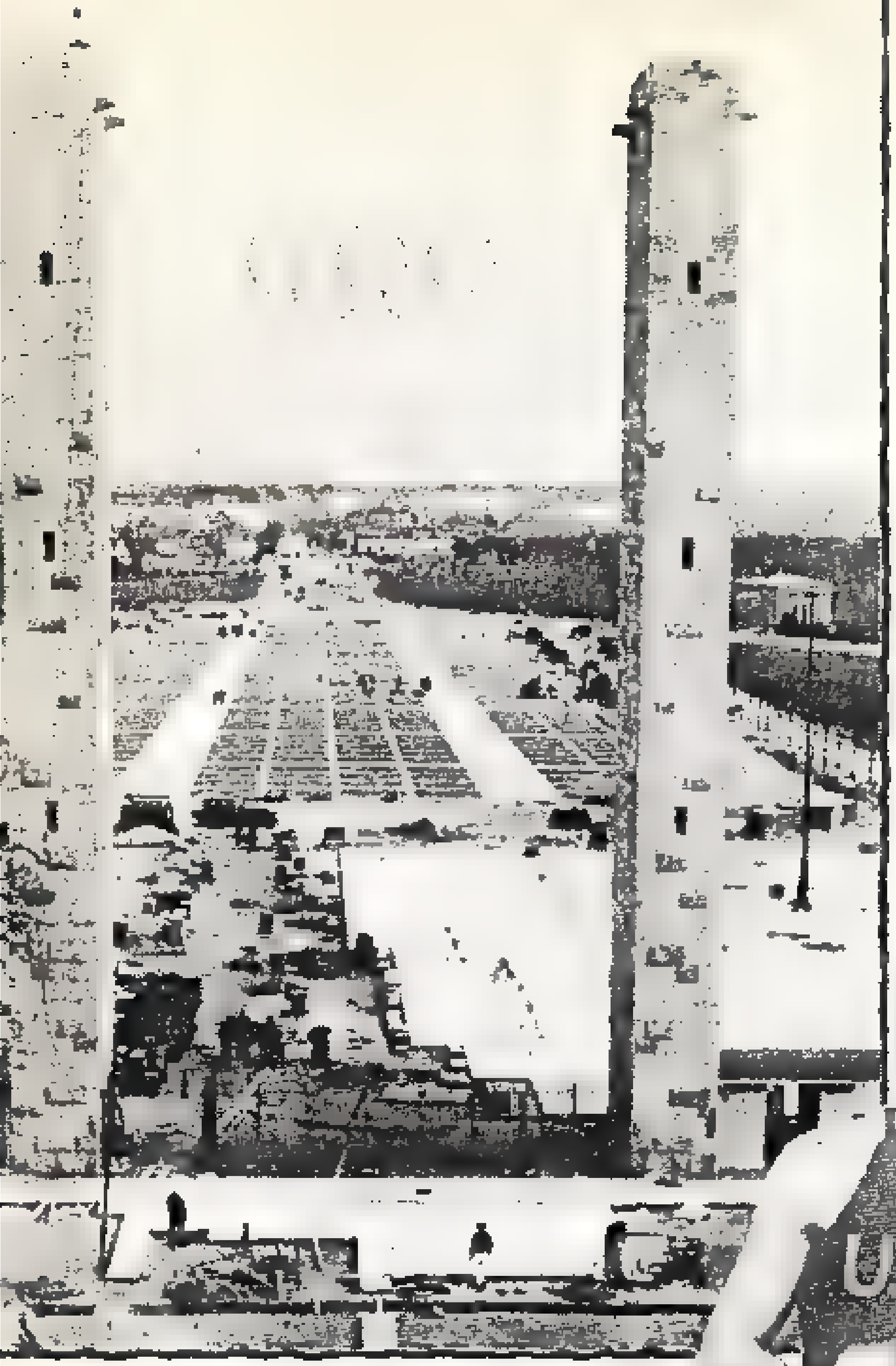
Air Corps Photos

Future airmen relax with checkers and magazines after a busy day with planes, bombs, cameras and difficult formations.



Every army flier must know something about aerial photography. A class is shown studying the various cameras used in map making.

Both wearing parachutes, an instructor prepares to take a student aloft for his first instruction at the "West Point of the Air."



German Railroads Photo

The main entrance to the Olympic Stadium, reached from the city via Adolf Hitler Place, is pictured above. Glenn Cunningham, one of America's hopes in the events, is shown at the right. A portable German wirephoto transmitter is shown below.

Science Vies *With* Sport at Olympics

SCIENCE vies with sport this summer at the Olympic Games in Berlin. The host nation is taking advantage of the ancient games to display Germany's advances to competitors and visitors from all parts of the world.

A $900,000 television system, 14 trucks carrying transmitting equipment to various sports centers, will bring visual broadcasts of the events to that portion of the 500,000 visitors unable to crowd into the array of new sports field about Berlin. It will be the first visual screening of the great open air sports event.

Berlin has not only constructed the great Reich Sports Field five miles from the heart of the city but has rebuilt much of the German capital in preparation for contests in which nearly 5,000 men and women will compete under the colors of 52 nations.

A 24-acre assembly field, scene of the opening ceremony, has been provided to accommodate 400,000 spectators and contestants. At one side is the Fuehrerturm, the 200-foot Leader's Tower, from which the Olympic bell rings. The bell, made especially for the games, is 16 feet high and weighs 10 tons.

The stadium proper is only slightly smaller than that at Los Angeles and will accommodate between 100,000 and 125,000 persons. Elevators have been installed to the upper tiers. An underground radio station will have connections with 30 stations and networks in all parts of the world. A staff of 400 engineers has been employed.

Contestants live in the Olympic Village, nine miles from the field and a city itself. A swamp was drained to provide the site. It contains a bank, a post office, and scores of one-story stone houses, each named for a German city and containing 10 or 12 double rooms for athletes.

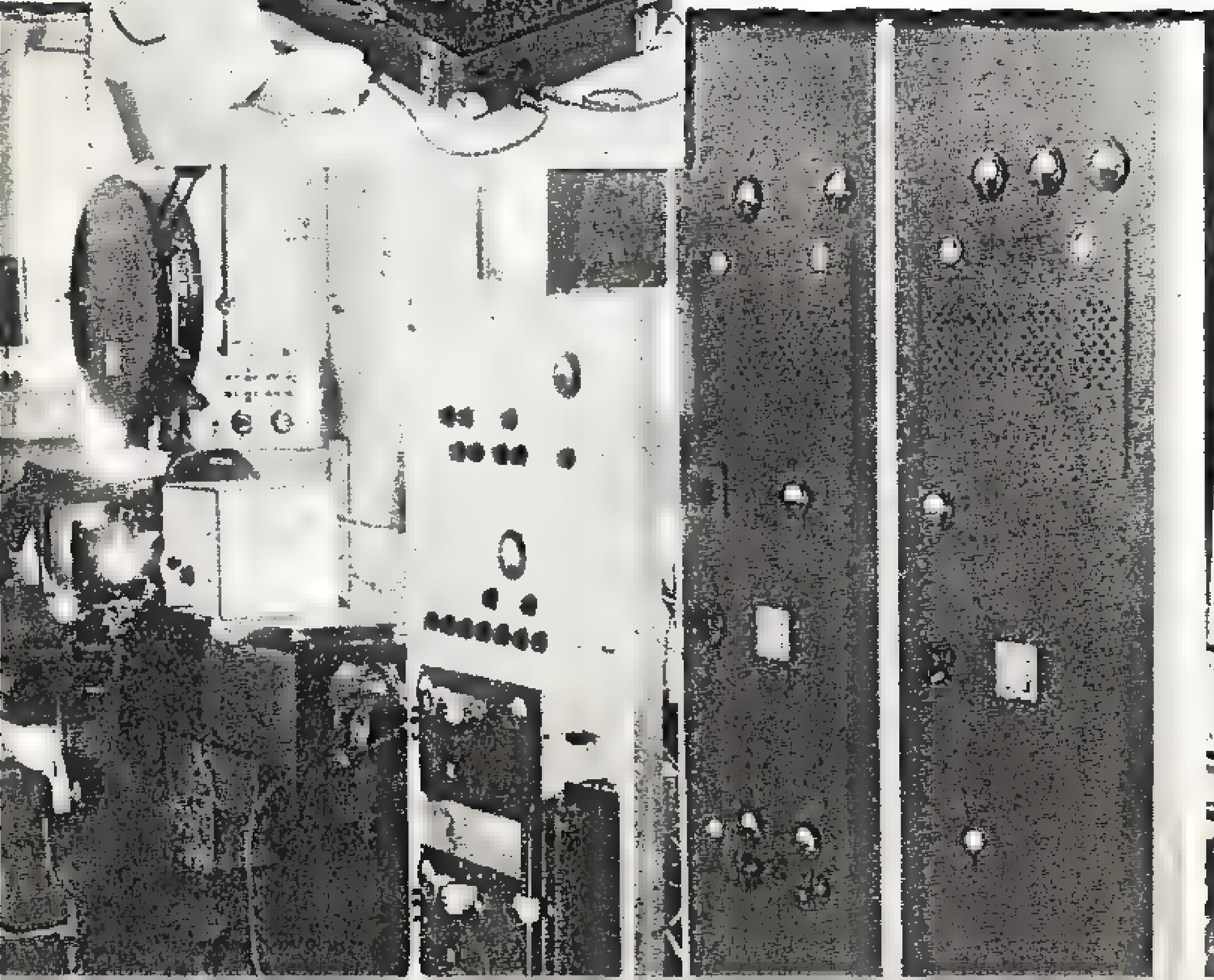
Preparations for the field gave employment to 1,000 workers and additional thousands labored on improvements rushed to completion elsewhere in Berlin for the event. These included a new crosstown subway with a special station for the games. A special railroad station was built and the city studded with information booths.

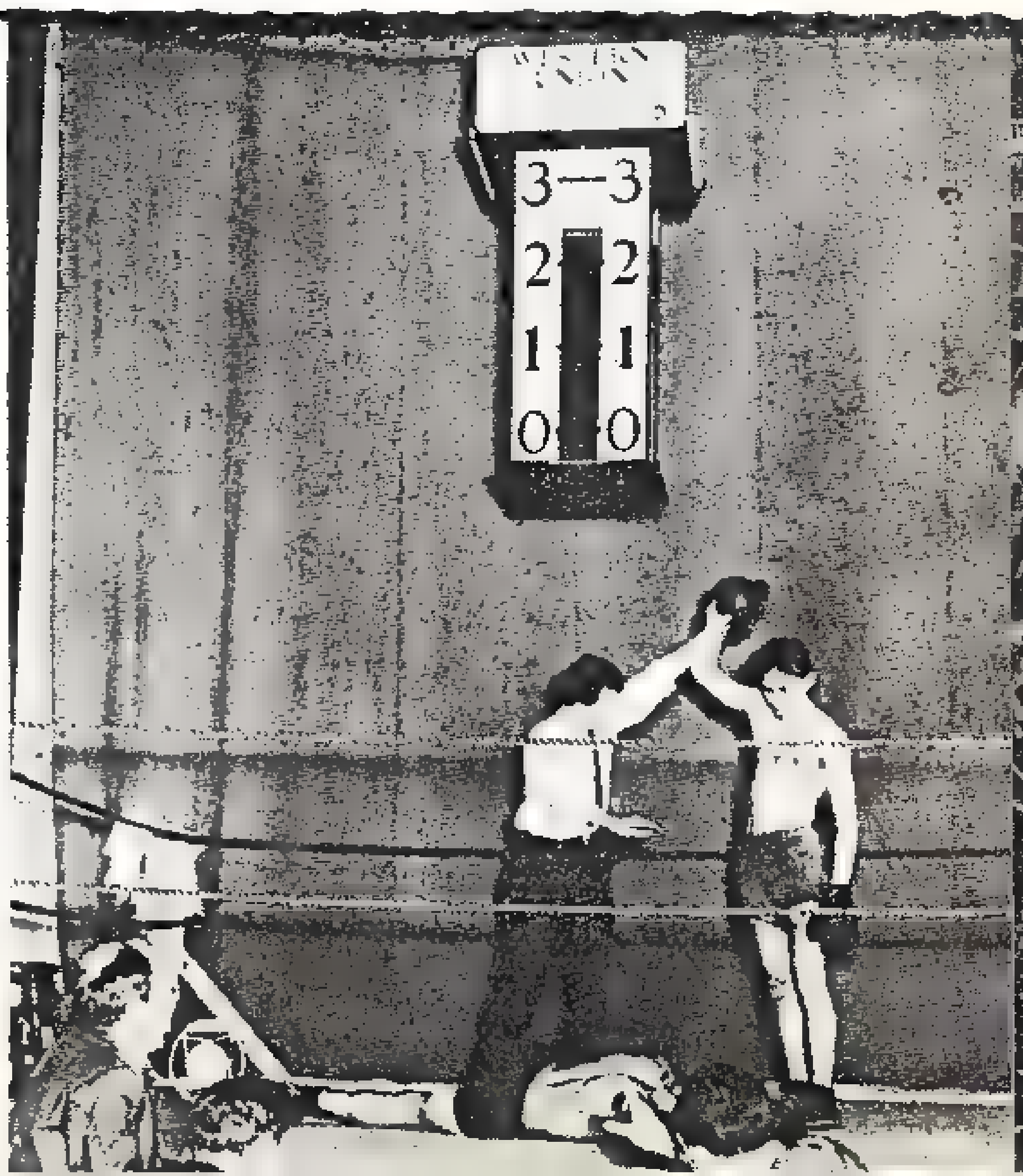
The sports area with the auxiliary swimming stadium, open air Greek Theater and other features, occupies 225 acres on the edge of the Gruenewald at the western side of the city. Parking space is provided for 10,000 automobiles in a single field.

Germany leads in the number of contestants with a team of 448. The United States is second with an aggregation of 395. Japan which hopes to hold the 1940 Games is represented by a total of 337 athletes, trainers and officials. The team is the largest ever entered by the nation in international competition.

Several new hotels have been built and many old ones rebuilt to provide 100,000 additional beds for visitors. Unlike the Los Angeles Olympic quarters of 1932, those in Berlin are of permanent construction.

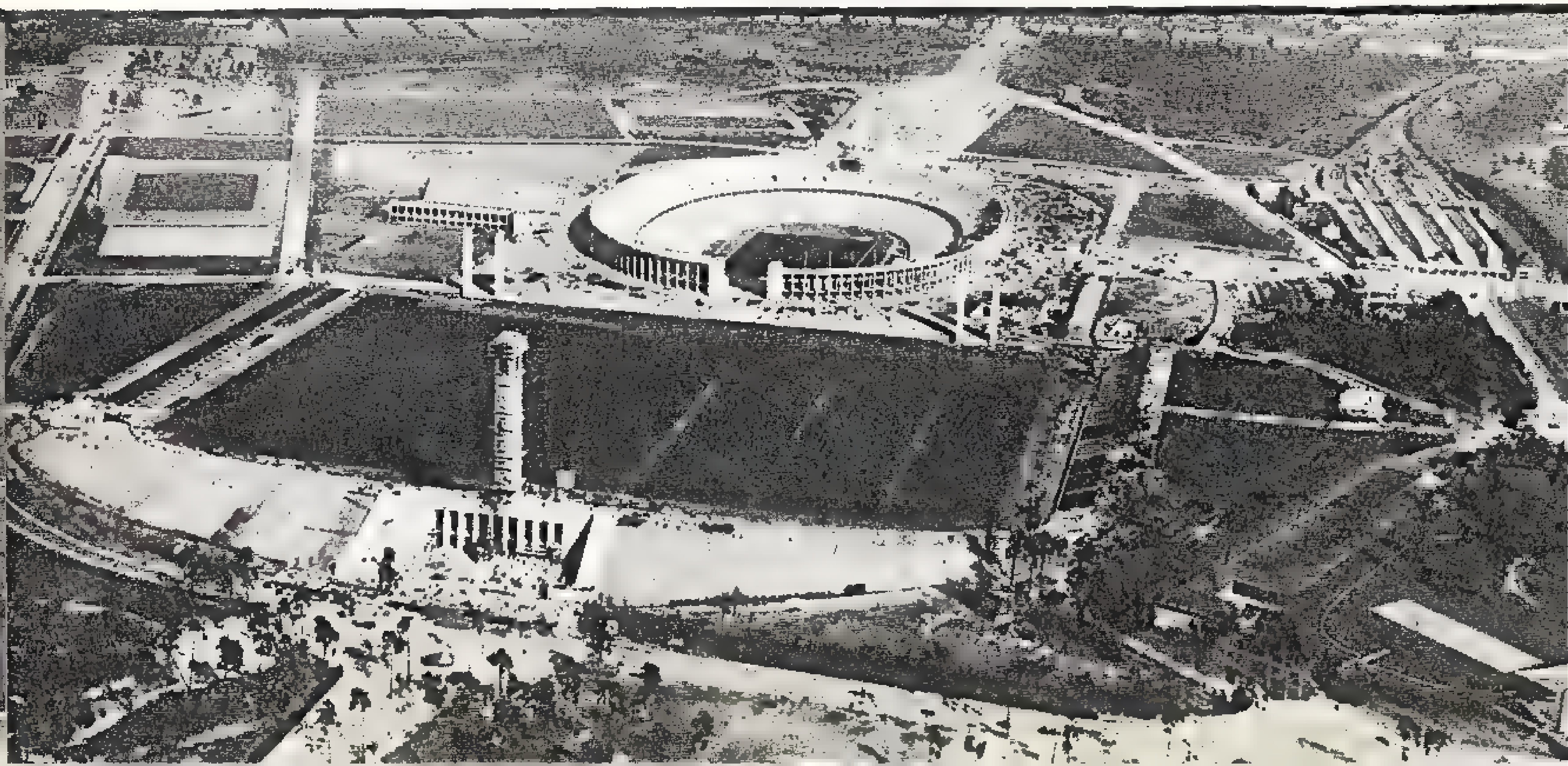
Berlin's newest television station is shown at the lower left. The film projector and picture scanner is in the rear. A new electric timing device for Olympic boxing preliminaries is shown at the right below. It registers the three-minute rounds, sounds the bell 10 seconds prior to the start of each round and counts the seconds when a boxer is floored. In the latter case, a mechanical speaker also gives a verbal count.





A general aerial view of the Olympic Stadium and fields is shown below. The 10-ton bell, pictured at top right, hangs in the tower in the foreground. There are tunnel entrances to the great Sports Field adjoining and to the stadium in the background. The Olympic station of the German Railroads can be seen at the right. German girl gymnasts are shown above.

German Railroads Photo



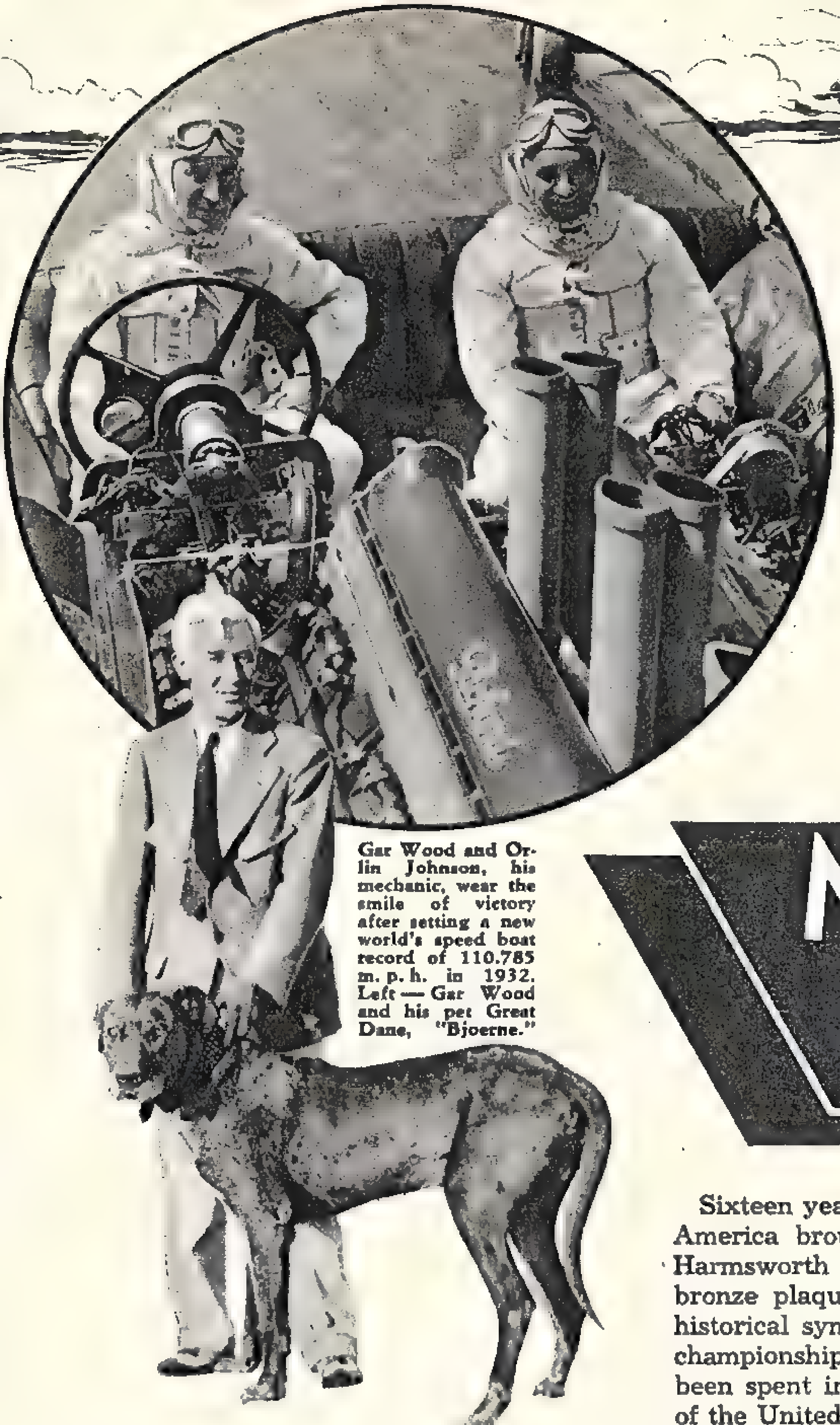
MISS AMERICA X

Making Boats Go Faster

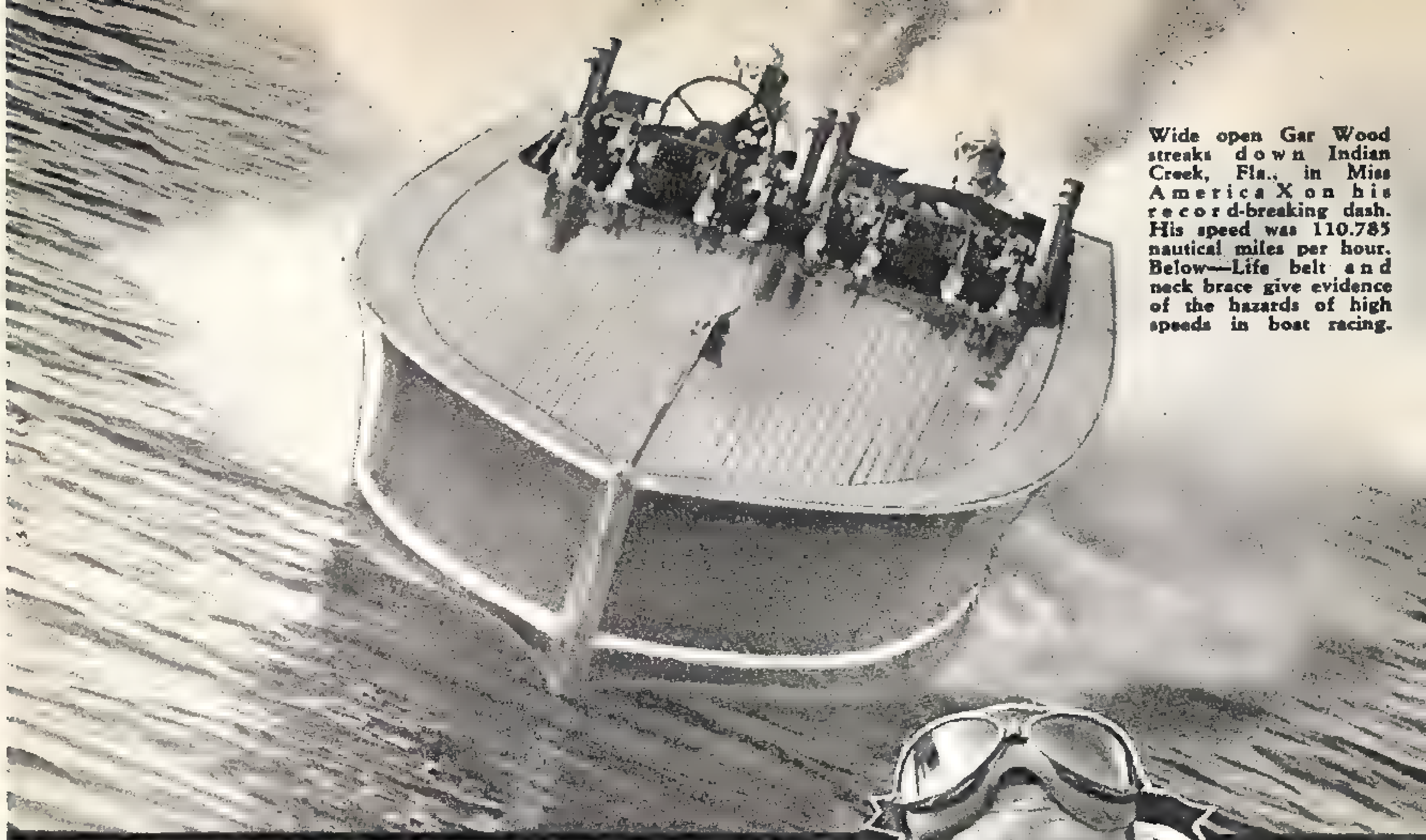
By Gar Wood

as told to PAUL WEBER

When water becomes as hard as marble, and waves rip vanadium steel bolts from the hull as though they were copper rivets—that's speed! America's premier boat racer takes you into the cockpit of Miss America X and shows you what it is like in this article.



Gar Wood and Orlin Johnson, his mechanic, wear the smile of victory after setting a new world's speed boat record of 110.785 m. p. h. in 1932. Left — Gar Wood and his pet Great Dane, "Bjoerne."



Wide open Gar Wood streaks down Indian Creek, Fla., in Miss America X on his record-breaking dash. His speed was 110.785 nautical miles per hour. Below—Life belt and neck brace give evidence of the hazards of high speeds in boat racing.

FOR a quarter of a century it has been my pleasure and pride to act as America's self-appointed champion in the rivalry among nations for speed supremacy on water.

I have been privileged to travel faster in an American-made boat, powered by American-built motors, than man has ever traveled on water before. Twenty-six years ago, I set my first world speedboat record, at the dizzy pace of 30 miles per hour. Today, my Miss America X holds the world record of 124.91 statute miles per hour.

Sixteen years ago at Cowes, England, Miss America brought to the United States the Harmsworth Trophy. In itself, this small bronze plaque is worth little. But, as the historical symbol of world motorboat racing championship, it is priceless. Millions have been spent in efforts to take the trophy out of the United States. It has cost me a king's ransom to defend it. But, thanks to luck and American engineering skill, I have been able to defend it successfully. Since the victory at Cowes, it has reposed without interruption in its place of honor at the Detroit Yacht Club. It does not belong to the Yacht Club, nor to me. It belongs—for a time, at least—to America.

These 26 years of experiment and struggle, have been a great adventure. I look backward with pleasure. But looking backward does not suffice; I am required also to look forward. Just how long I expect to be able to continue holding water speed honors in the United States is a question that I am often asked. Is the practical limit of speed on water approaching? Is it possible to go on indefinitely adding miles to that mark of 124.91 M. P. H.?

I should like to be able to make some satisfying reply to these questions. But I have no idea what the "practical limit" of water speed may be, if, indeed, there is such a thing. I feel sure that 150 M. P. H. is well within the possibilities of boats of present basic design. How far beyond that we can go without some radical change, particularly in power plants, it is not within my power to prophesy.

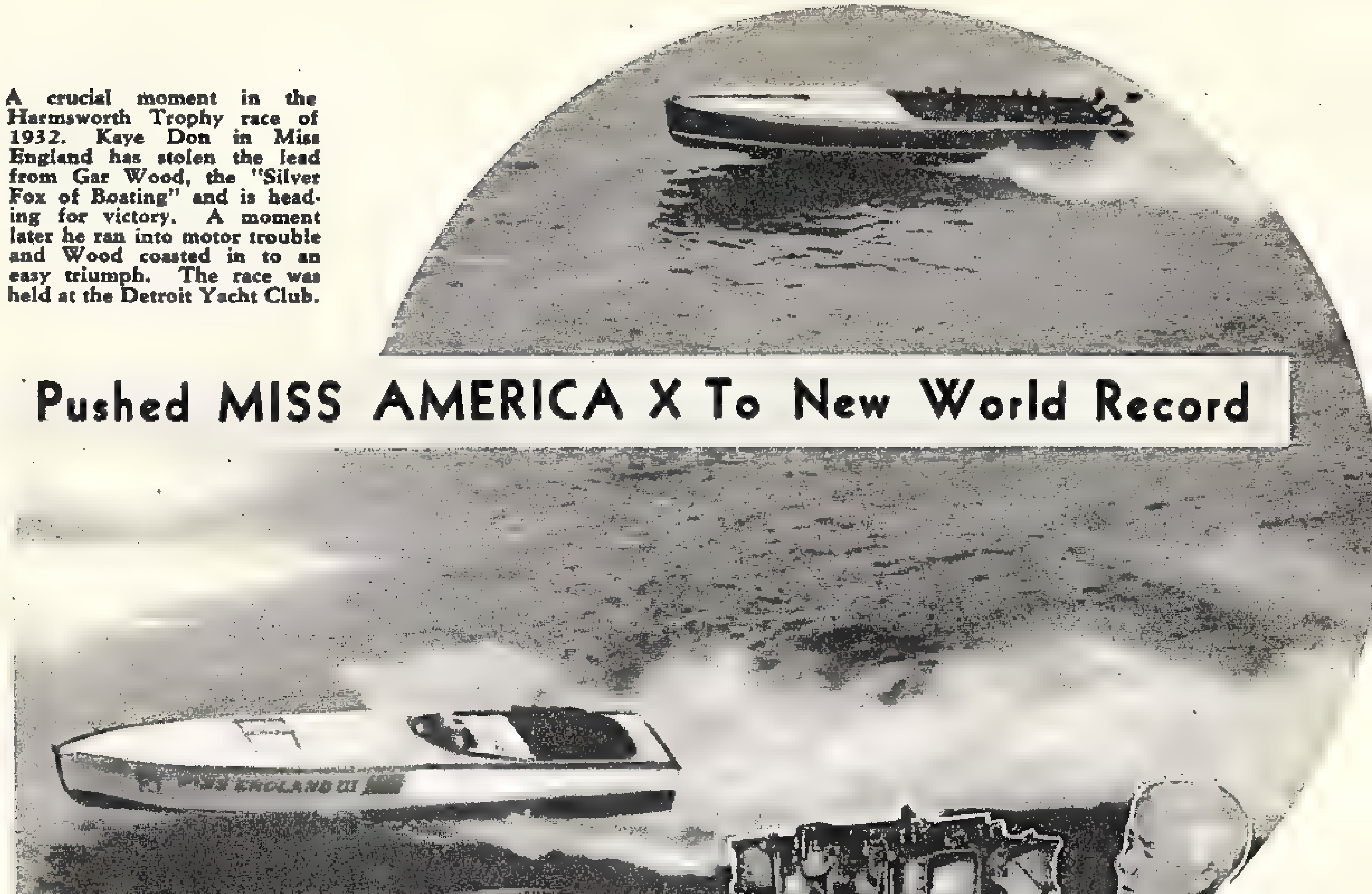
One thing definite is that the battle for speed honors has become a battle for more power in motors. Give me a 3,500-horsepower motor and the world will see a "new deal" in speed on water. But you could not buy such a motor in America today for its weight in government bonds.

A 3,500-horsepower motor is not an impossibility. However, before we go into the reasons why such motors are not made in this country, let us consider the two things that produce speed in a boat like the Miss America X. These two factors are *power* and *planing ability.*

Boats of the Miss America type are known as hydroplanes, which means "water planes." The hydroplane does not plow through the

Miss America Tenth, in the background, pulls up to pass Miss England III in the Harmsworth Trophy race. Gar Wood piloted Miss America, and Kaye Don piloted Miss England. Wood won.

Veteran Boatman Tells How Power of 6400 Horses Pushed MISS AMERICA X To New World Record



A crucial moment in the Harmsworth Trophy race of 1932. Kaye Don in Miss England has stolen the lead from Gar Wood, the "Silver Fox of Boating" and is heading for victory. A moment later he ran into motor trouble and Wood coasted in to an easy triumph. The race was held at the Detroit Yacht Club.

In his father's footsteps. Gar Wood, Jr., poses for cameramen after setting two records in Class A and C events at the National Motor Boat Sweepstakes.

water like an ocean liner or a pleasure yacht. It skims over the surface when going at high speed, and the hull rides almost entirely out of the water. This "planing" is caused by the lifting power of the plane surfaces which make up the bottom of the boat's hull. It is extremely important that these planing surfaces are set at the proper angle in relation to each other to bring about the proper lift. On the Miss Americas we have always used only two planing surfaces. On their relative positions depends her maneuverability, speed and, in fact, her actual existence.

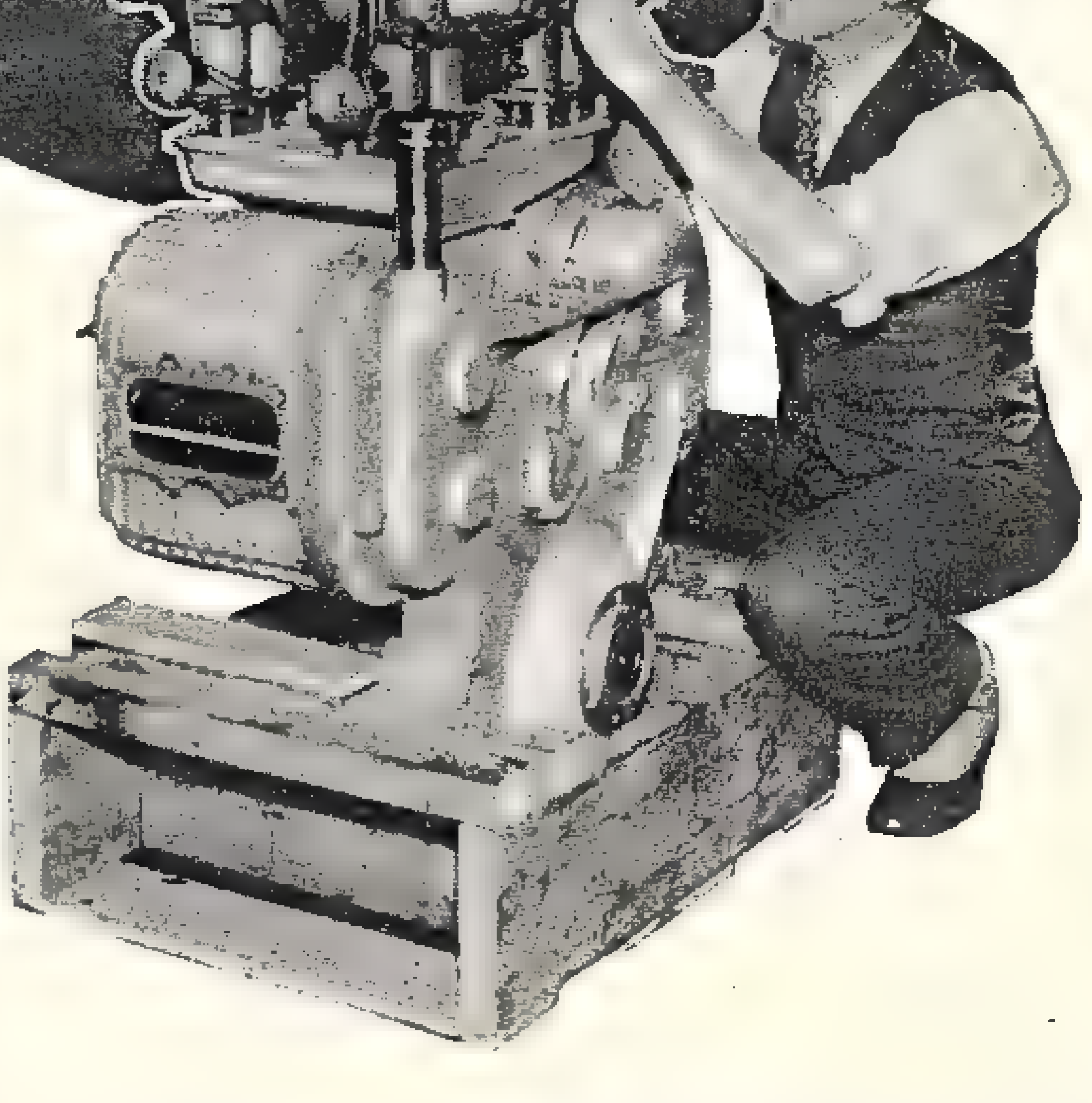
The sharp break in a hydroplane's hull where the forward planing surface ends and the aft planing surface begins, is called the "step." The forces effective on the planing surface ahead of the step are unbelievable. The planks on the bottom of Miss America X are bolted to the hull timbers with bolts of vanadium steel, heat treated for the utmost strength. Yet we sometimes find them wrenched loose, as though the water had gigantic fingers.

When Sir Henry Seagrave, of heroic memory, was killed at Lake Windermere in England, in 1930, it was stated that his Miss England hit a floating log. In my opinion, what really happened, was this: Sir Henry was experimenting with the location of his "step," to make his boat plane properly. He had not been able to figure it out mathematically or from experience. So he fastened a makeshift temporary "step" on the bottom of his boat, with the idea of changing its position to suit conditions.

He was wrong. It proved not strong enough. The water's pressure tore part of the "step" out of the Miss England. The boat overturned and Sir Henry was crushed to death. He was a great sportsman and a hardy competitor. His death was a tremendous loss to England and the whole world of sport.

Through continued experiments and the construction of the successive Miss Americas, we have assembled a treasury of information about what takes place in that small area—hardly larger than a kitchen table top—where the speeding hydroplane rests on the water. We feel that American engineers now know at least as much about this factor in building super-speed boats as any other engineers in the world. Although there is much still to be learned in this field, boat design has ceased, at least for the present, to be our major problem.

The second factor in the make-up of a hydroplane is power. And that's something else. The engines installed in the Miss America X are four Packard V-twelves, the most powerful gasoline motors in the United States. They are direct descendants of the famous Liberty engine. This motor was designed and developed by Col. Vincent, of Packard Motor Company, and Mr. Hall, of the Hall-Scott Company, and their associates, for American airplanes during the world war. Fundamentally it was as good a motor as had ever been built, and it is still practically as good a motor as can be obtained in the United States today, power for weight, for marine purposes. Of course these Liberties haven't sufficient power for super-speed boats, although they were used in the first five Miss Americas.



Gar Wood is now searching for the 3500 horsepower motor, light enough for a speed boat. He is convinced that speed boat supremacy rests not in boats and men, but super-motors.

The Packards in the Miss America X originally generated 725 horsepower each. By applying superchargers and various experimentations, we have stepped them up to 1,900 h. p. each. This illustrates the possibility of increasing power by persistent effort, and it sounds like a tremendous lot of horsepower. But let's see what sort of power Harmsworth challengers bring against us. When Lord Wakefield sent Kaye Don over to drive his Miss England III in 1932, the Miss England carried two Rolls Royce motors capable of developing nearly 2,500 h. p. each—a total of 5,000 h. p. against the 3,000 we could develop with two Packards in Miss America IX.

To be sure of enough power to drive the Miss America X to victory we decided to use four motors against Don's two, regardless of additional weight. In other words, pounds for horsepower, the British challenger was far better equipped than we were. Miss America X's weight was approximately ten

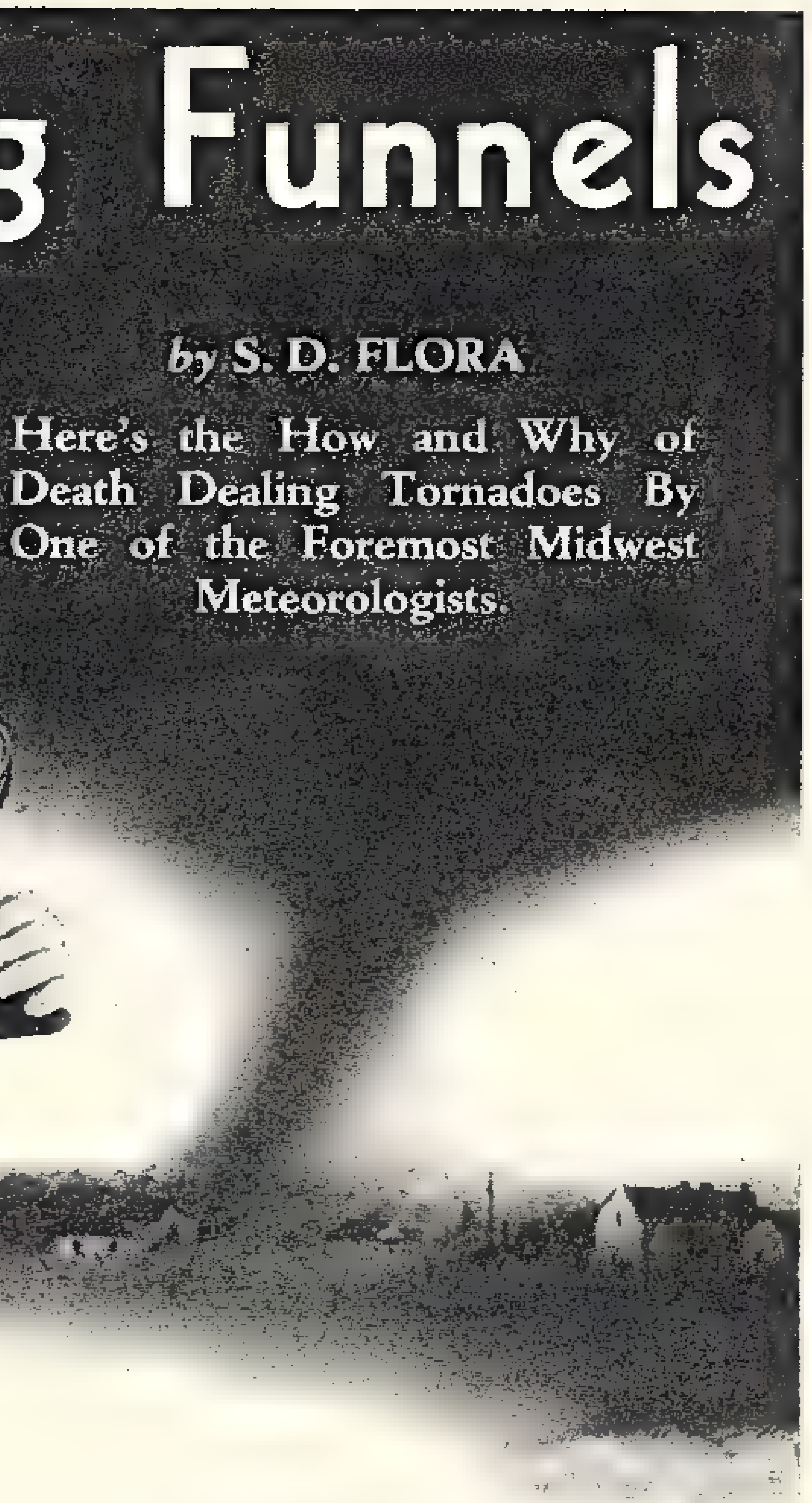
[*Continued on page* 135]

Whirling Funnels Spread Disaster

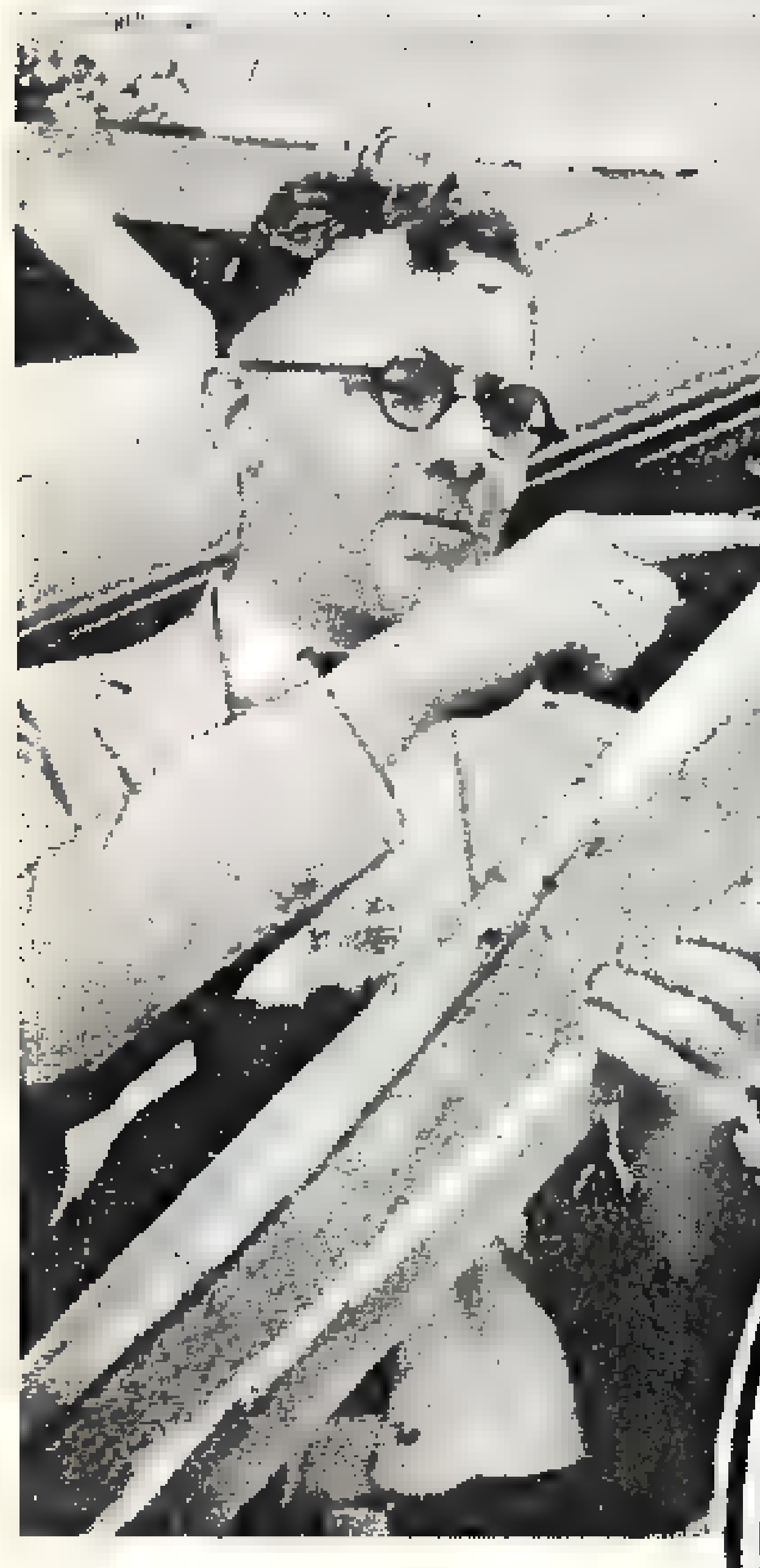
by S. D. FLORA

Here's the How and Why of Death Dealing Tornadoes By One of the Foremost Midwest Meteorologists.

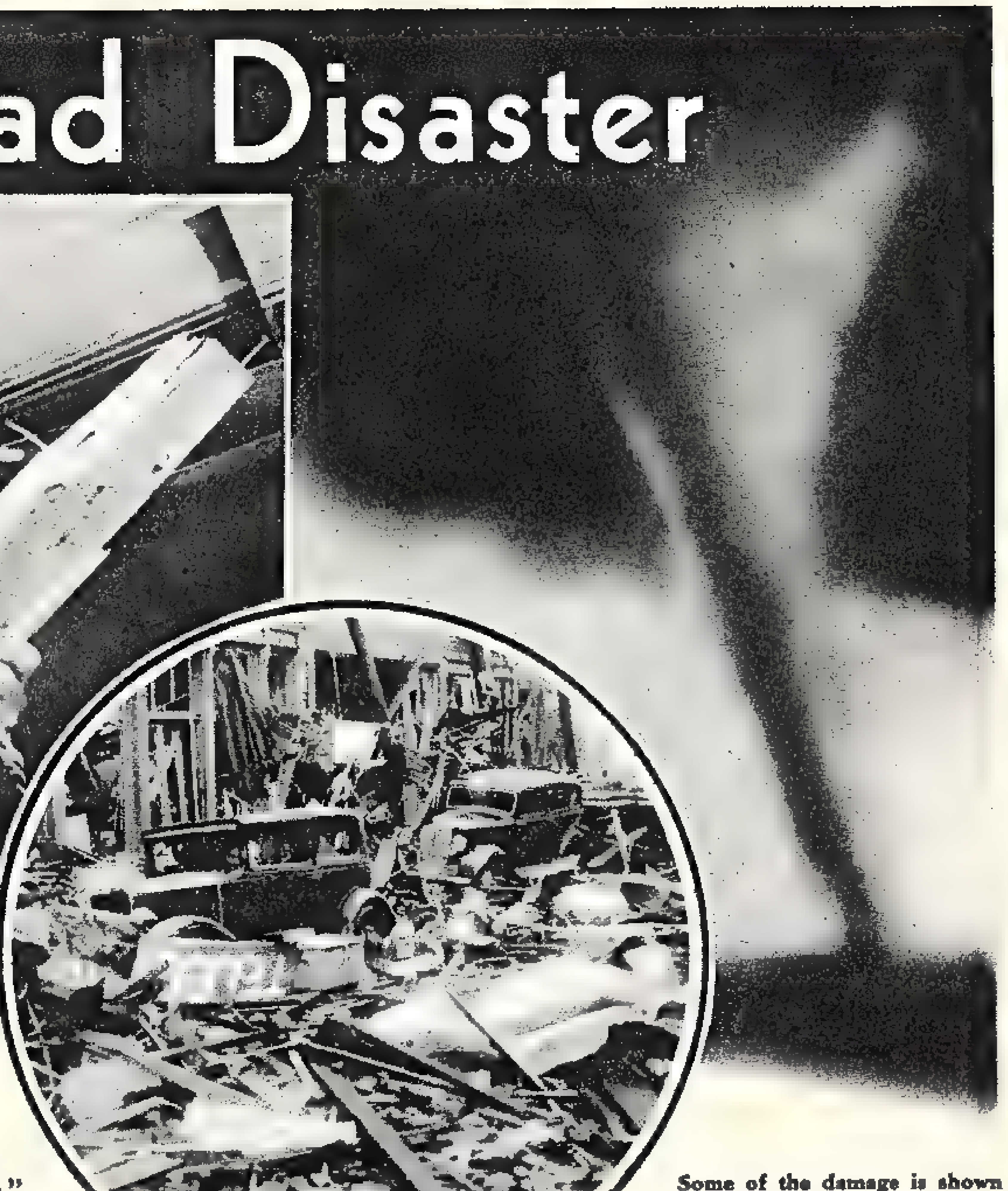
The author, who for years has made a hobby of tornadoes and their vagaries, is shown broadcasting a weather report in Topeka, where he is U. S. meteorologist.



Terror is the natural reaction when a storm of this kind appears. This tornado swept through the northern suburbs of Wichita, Kansas, on February 24, 1935, injuring six persons and causing $10,000 damage. Two miles farther south, a great disaster would have resulted.



This splinter was driven deeply into the post during a small tornado in the suburbs of Topeka on June 3, 1927. E. C. Corkill, Weather Bureau official, is examining the splinter, which could not be removed without breaking.



Some of the damage is shown at the left after a tornado killed 203 persons and caused $6,000,000 damage in and about Gainesville, Ga., last April 6. Inhabitants of Hartner, Kans., dived into their caves so rapidly that the above twister passed without fatalities on June 2, 1929.

A TORNADO is the most violent type of storm known to inland America. Except in daytime in the open country, tornadoes come without warning—a terrific roar, commonly described as resembling "a thousand freight trains," often a weird whistling sound, and the crash of wreckage, and the storm moves on, leaving a trail of desolation and often death that seems incredible considering that the passage of the storm requires only a few seconds.

In the 20 years ending with 1935, Weather Bureau reports list 2,702 tornadoes, with a death list of 5,258 and a property loss in excess of $225,000,000. The greater number of these storms occurred in the mid-western and southern states, though very few parts of the country have escaped.

In the open country of the plains states, tornadoes occurring in daylight hours can often be seen approaching, sometimes a quarter of an hour before they strike. There is a swift exodus of families into basements or storm caves. Experienced persons in these sections often seem to develop a knack for recognizing "cyclone weather," and are alert to take refuge when threatening clouds loom up. This results in many unnecessary rushes to basements and caves, but it saves human life when a tornado really strikes. In large cities, with vision cut off by buildings and the warning roar of the storm muffled by city noises, there is seldom any notice of a tornado until buildings begin to crumble. Life then becomes a matter of chance.

A tornado, still miscalled a cyclone in spite of the educational efforts of the Weather Bureau, is caused under certain conditions by abnormally warm, moist air being overrun by colder air. The warm air, being lighter, is forced up through the colder, much as a cork is forced up in water, and its movement is governed by the same law of moving liquids that sets up the whirl in a draining bath tub, except that in the case of the tornado the movement is upwards.

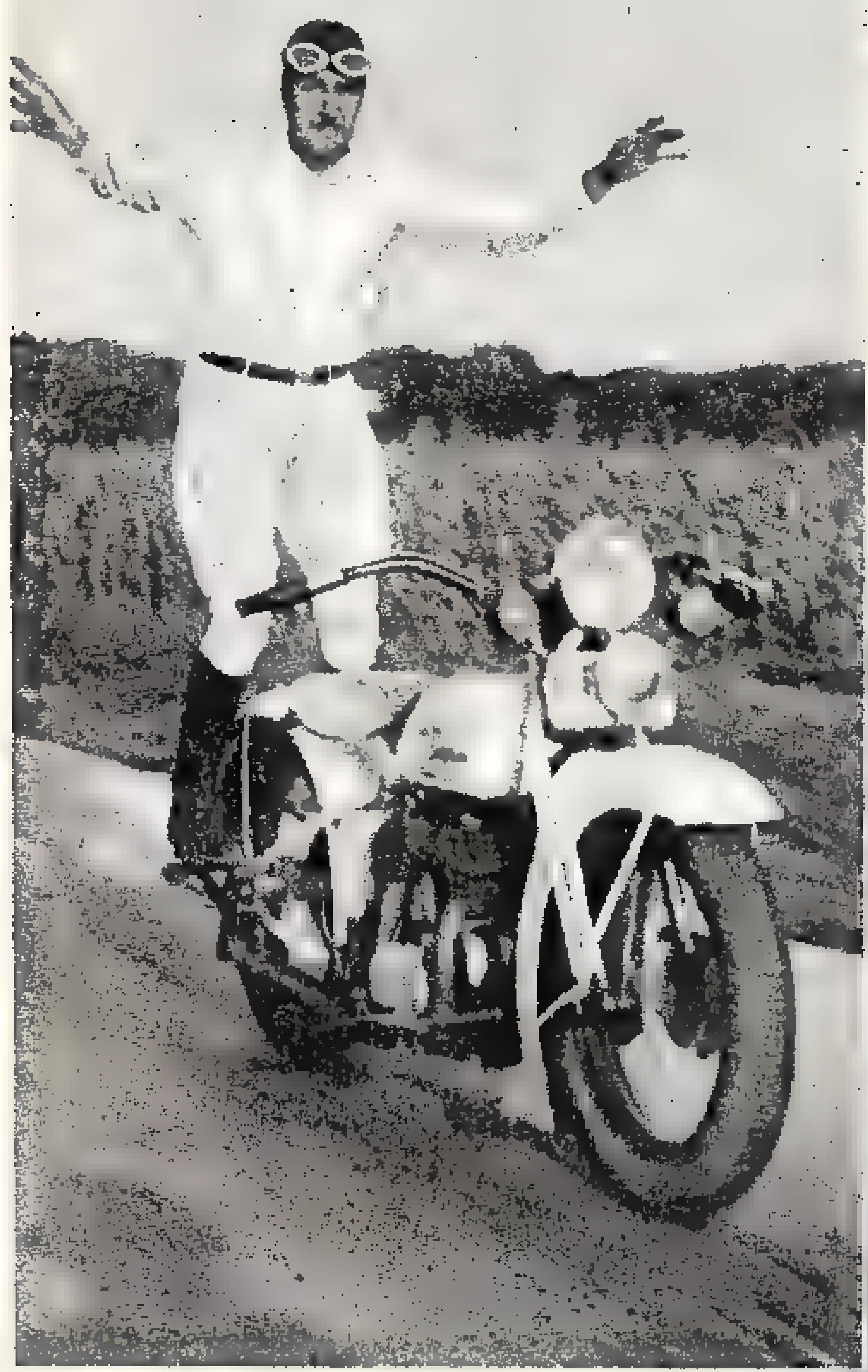
The usual description by persons who have seen the start of a tornado is: "Two clouds seemed to come together." A violent whirl starts at the cloud level and bores its way down towards the earth's surface. When it reaches the ground destruction begins and dust and dirt drawn up soon make the cloud a menacing black color, usually with much lightning and hail.

The speed of the whirling winds in a tornado has never been measured, but has been estimated at 300 to 500 miles per hour. The decreased pressure inside the whirl, similar in a way to the vortex in a draining bath tub, actually causes buildings to explode when the normal atmospheric pressure inside the walls is suddenly exerted against the lowered pressure outside as the tornado passes over.

Tornado clouds are generally spoken of as being funnel-shaped, but eye witnesses often describe them as resembling ropes dangling from the sky, as "snakes in the sky," or more commonly as resembling an elephant's trunk. The latter is a very apt description, as the cloud has a tendency to sway back and forth as it moves along its path. A collection of almost 200 views of tornado clouds in the Topeka Weather Bureau, probably the largest collection of its kind in the world, shows some that are inclined from the vertical until they are almost horizontal, some that seem to be bent into right angles, some that are larger at the bottom than at the top, and some that are huge vertical columns.

Tornadoes travel along their paths at what in these days is considered a moderate rate of speed—usually 30 to 40 miles per hour, and seldom more than 60 miles per hour. They can readily be out-run by a person in an automobile with an open road ahead. It is even possible to avoid them on foot, if they are seen in time, by running at right angles to their path, preferably towards the north

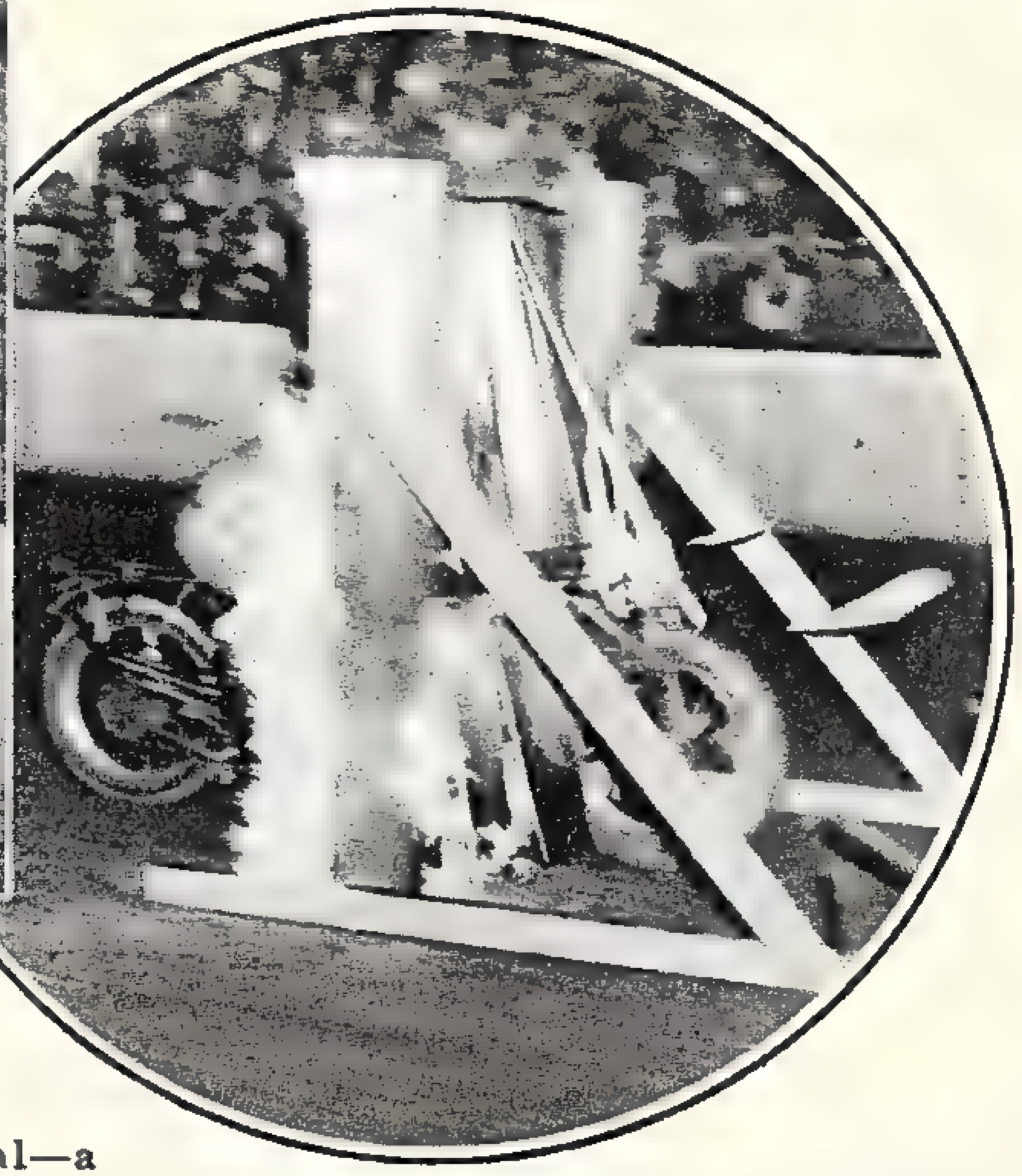
STUNTING *on a* MOTORCYCLE



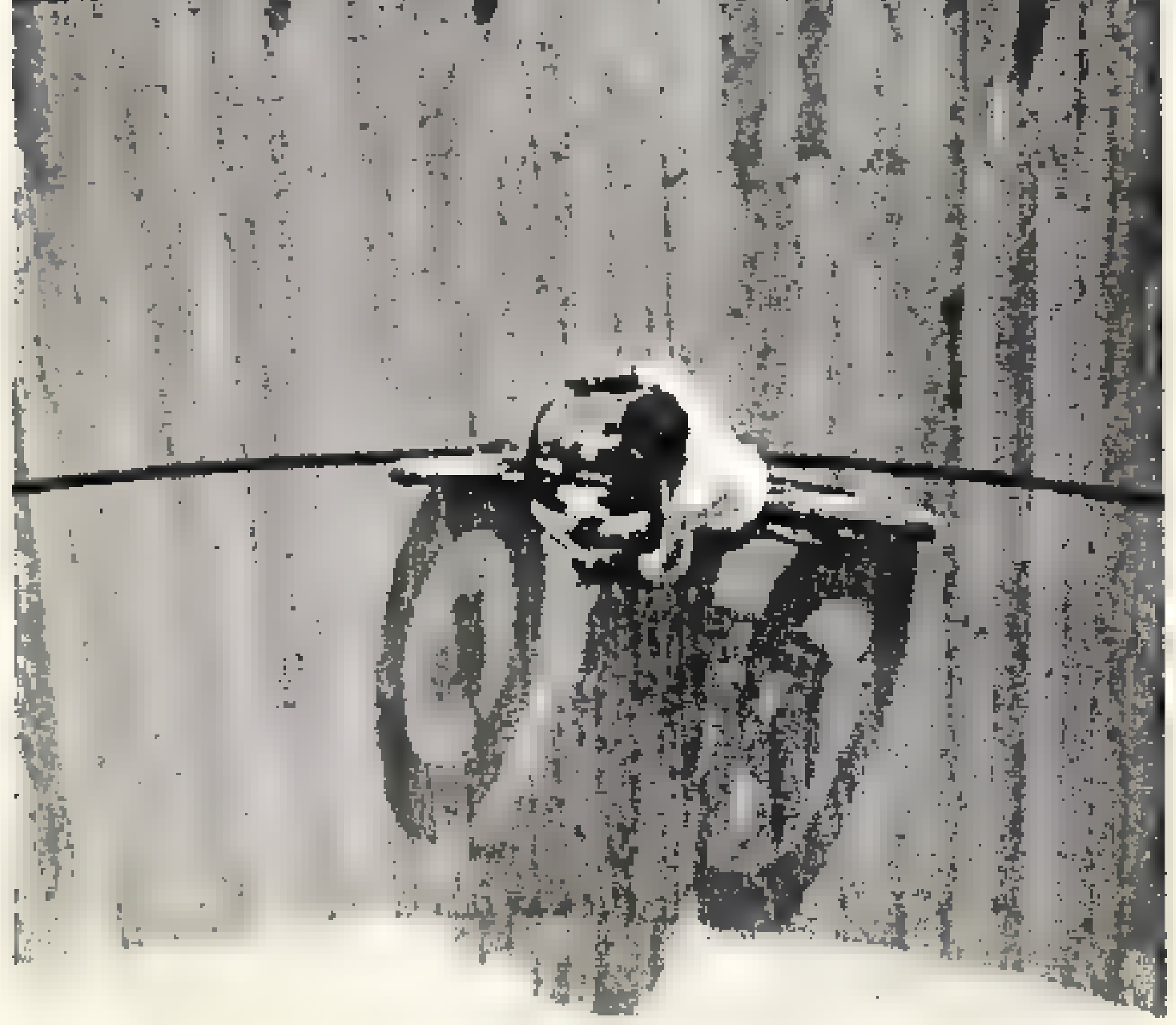
It looks easy but it really isn't. This champion rider illustrates a riding pose which, difficult as it is in itself, is the basis for shooting balloons, juggling balls, riding backward and other antics.

F. LELAND ELAM

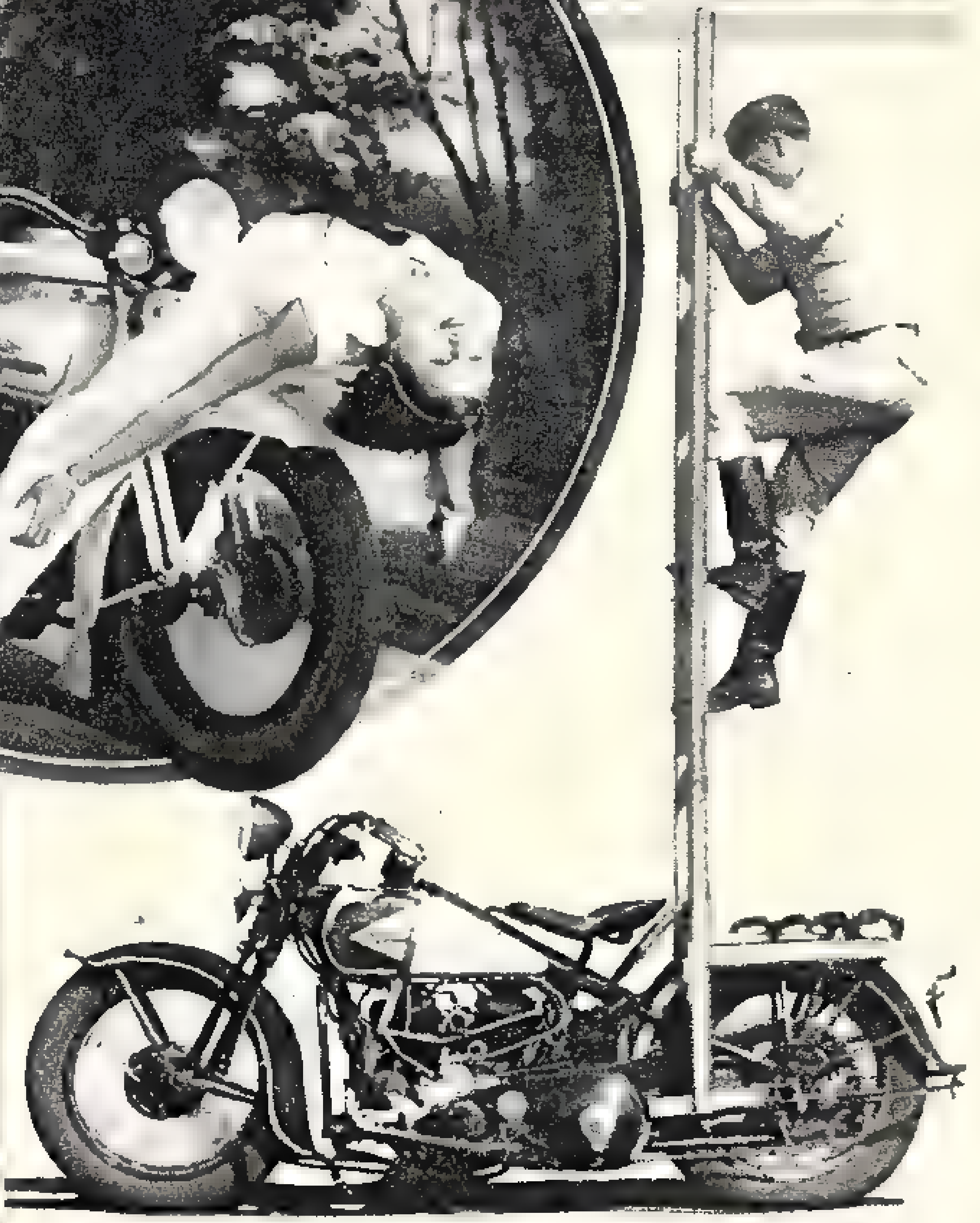
tells the inside story of professional stunt motorcycling—riding the bronco bikes.



San Francisco's Don Rodman, a super daredevil, claims that crashing The Wall of Death is only dangerous to those who haven't the feel of their wheel, who are nervous and careless.



Gene and Ruth, a pair of well-known stunters, are shown here in action at Lincoln, Neb., Ruth leans back over the front wheel while her partner balances on one foot in the saddle. George Sowopoulos, famed Greek performer, is shown below riding a Harley-Davidson in a wall exhibition at Athens.



Could you climb a ladder atop of a driverless motorcycle spinning along at a steady pace, as shown in the thrilling picture above? The stunt rider does it by climbing the ladder backwards, crossing the top; then descending the other side. But it's an indoor stunt. If there is any wind whatsoever, a bad spill is the inevitable result.

THRILLING, exciting, sensational—a three-word description of motorcycle stunt riding. Since the introduction of night lighted stadiums, oval track motorcycle racing is growing fast in popularity and with this breath-taking sport has come the rebirth of stunt riding.

Putt Mossman, Oakland, Calif., champion stunt rider is taking its popularity around the world. He is touring with a group of riders.

"Any person who is physically fit and can ride a motorcycle can learn to do stunts," explains Lawrence N. Weaver, prominent California stunt rider, and a member of the California Highway Patrol. "They must, however, have a perfect sense of balance to be able to carry on with stunts after they start them or an accident will result. They must have that sixth sense which automatically tells them just where to put their foot or which way to sway their body. They must be cool and not nervous, have no fear, and be confident.

"Partner stunting is the most difficult. They must have perfect confidence in each other. They must synchronize in their work.

"There are no set rules for doing certain stunts. Each rider must work out his own procedure as best suited to his own build and weight. All real stunting motorcycles are lower than stock machines although a stock machine can be used for many stunts. The safest stunting speed is from 30 to 35 miles an hour. There are many different stunts and only a few that are new. There is a future in motorcycle stunt riding for the persons who can meet the requirements."

One of the most thrilling of motorcycle stunts is wall crashing, says Weaver. At night it is exceptionally spectacular. The requisites for this stunt are steady nerves, a sturdy and speedy machine.

The wall is six feet square. It is constructed of boards ¾-inch thick and six inches wide, nailed on a frame of 2x4 foot boards with 4x4 foot posts at each side. The rider always picks the wall boards as they must be soft, fir being used mostly, free of knots, and straight of grain.

A piece of mosquito netting is tacked loosely on the side from which the crash is to be made. Excelsior is placed between the wall and netting. Coal oil is poured over it. Just before the rider starts on his 70-mile-an-hour ride the material is set afire. When the wall is crashed the rider passes not only through a wall of wood but a wall of flame.

Metal hand guards and a metal helmet are the only protective measures taken by the rider. A horseshoe shaped frame of steel extending from the front wheel forks over the handlebars and down to the other side of the wheel is used sometimes instead of the plates on the handlebars.

It is necessary for a rider to take many positions on the cycle and he must have a feeling for the proper position for his feet so as to get the correct balance. Among these stunts are ones in which the rider stands on the seat. While this is no easy trick, it is made difficult by shooting balloons, playing a drum, juggling balls, and riding backward.

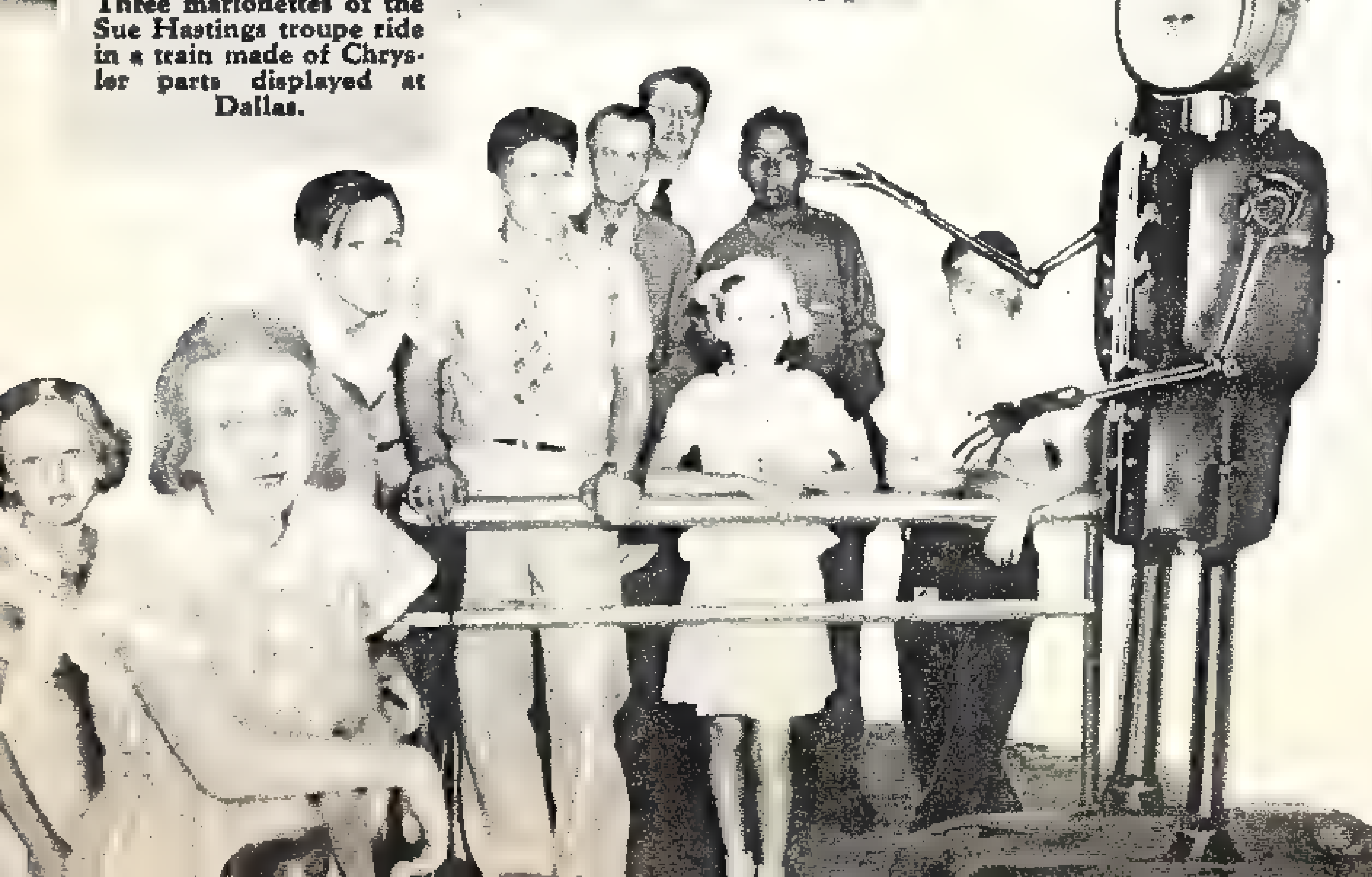
[*Continued on page* 127]

Auto Triumphs Feature Texas Centennial Show

Decked with the traditional Lone Star flags, this Court of Honor is one of the principal features of the $25,000,000 Texas Centennial celebration at Dallas. The Hall of Petroleum appears in the background. A night view of the Esplanade is shown in the star with searchlights illuminating the scene in the Hollywood manner.

Part of the imposing $2,250,000 Ford show is shown in upper left. General Motors has a $950,000 display in the above building.

Three marionettes of the Sue Hastings troupe ride in a train made of Chrysler parts displayed at Dallas.



Frances Nalle, 21, red-haired Dallas beauty, is official "Bluebonnet Girl" at the Exposition. A robot made of auto parts draws a crowd at the left.

EXHIBITS showing automobile advances in speed and safety are almost half of the dollar value of the $25,000,000 Texas Centennial display now attracting visitors by the thousands to Dallas, Texas.

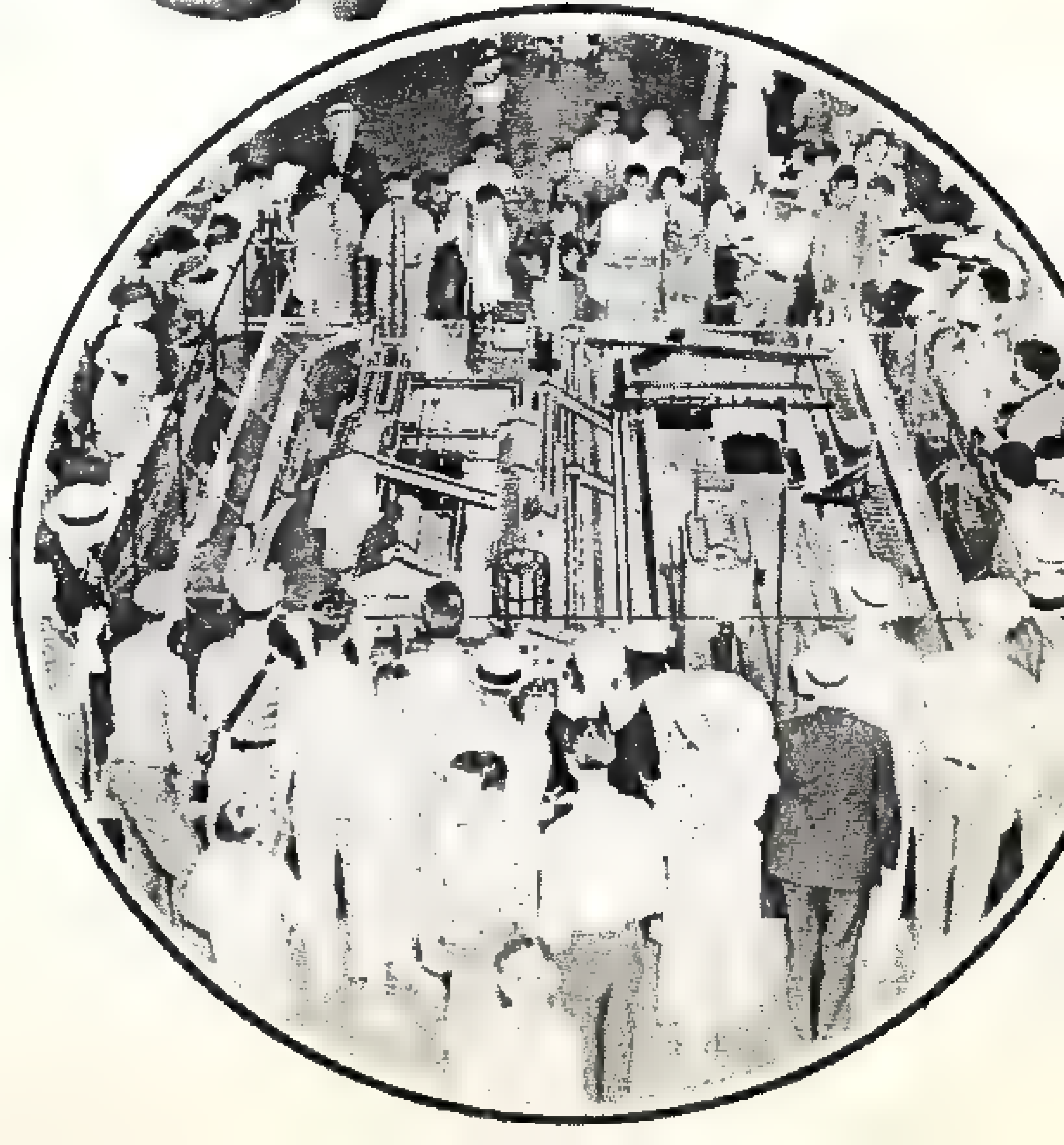
Largest exhibitor at the celebration marking the 100th anniversary of Texas freedom is Ford with a $2,250,000 display. General Motors has a building and display valued at $950,000. Chrysler is present with a $500,000 exhibit. The event continues through Nov. 29.

The Ford show includes 15 major exhibits in the air-conditioned Ford Exposition building. A replica of the company's by-products plant, complete to railroad sidings, attracts model railroad enthusiasts. There is a service exhibit showing the development of auto service from the blacksmith days to the present.

All of the exhibits show methods of testing materials and means of assembling. A mechanical man made from auto parts is a feature of the Chrysler show. He not only turns his head and lifts his arm but he can hear and speak as well.

[*Continued on page* 126]

Pretty Jane Collins is one of the "Rangerettes" adding beauty and color to the show. Below, a replica of the Ford by-products plant, complete to railroad sidings, attracts scores of visitors.



TACKLE SUGGESTIONS FOR THE BEST BASS FISHING

by **ROBERT PAGE LINCOLN**

A GREAT satisfaction to the bass fisherman is a tackle outfit that will give him the maximum in enjoyment in handling, but which will, at the same time, touch the peak in effectiveness: The right rod, the right line and the right lure for the occasion. That bass may be taken at times on very crude tackle goes without the saying, but it is not all of fishing just to fish.

Fishermen are rapidly getting in the habit of using both a bait casting rod and the fly casting rod in their fishing, having come to a realization of the fact that where the one will not avail itself, there the other one may prove unusually effective. To be efficient in both departments is, therefore, to a decided good effect and gives one the unusual opportunity of testing out both methods of fishing where the situation calls for one or the other lure and manner of delivery. Obviously the fly rod has no place in the midst of the pads and other vegetation when the bass are in such locations. Here the bait rod, with various weedless pork-rind and wire-guarded lures, will prove effective. But where unobstructed water is to be met with, around rocks, sunken trees, stumps, etc., there the fly-rod will do wonders, and may produce bass when the bait rod will be found wanting. Drop a fly in combination with a spinner on a shaft in these last-named locations, and it is a wise bass indeed that does not make a dash at it with deadly effect.

The bass fisherman, therefore, who carries with him both the fly-rod and the bait-rod has at his command two deadly weapons, for which any bass water affords an opening. It is because the bait rod and fly rod can thus work together so effectively that the fisherman should possess and should become proficient in the use of both rod types and their methods.

Bait casting for bass is, without doubt, more commonly practiced throughout the country than any other manner of taking bass.

The first bait rods that were put forth in this country were rather long, ranging in length up to eight feet. From this extreme length they went to the other extreme and dropped down to as short as 3, 3½ and 4 feet. In more recent years this rod length was stepped up to the extent that 5 and 5½-foot rods are now considered standard for length, although 4½ and 6-foot rods are to be had, the latter especially fitted for the casting of very light lures.

It is obvious in the selection of a bait casting rod in bamboo that it should be picked according to the weight of bait that is to be used. There are light, medium, heavy and extra heavy bamboo rods. That fishermen attempt casting heavy lures with a too-light bamboo rod accounts for breakages every season. It is obvious so far as bamboo rods are concerned that they should be definitely picked according to the work they are supposed to do. *To treat a bamboo rod otherwise is sheer injustice.*

No bass fisherman can resist the lily pads. Here lurk the big large mouth, waiting to be tempted by a pork-rind lure or any other weedless baits. This lake is typical.

Like trout, small mouth bass prefer fast water, although now, due to stocking, they are found in both streams and lakes. In this water, a fly rod is a big advantage.

The small mouth bass is one of the gamest fish in fresh water. This catch represents a day of thrills for three men. Either bait rod or fly rod lures can be used against this battler, depending upon type of water.

A short cast into fast water, and Robert Page Lincoln has hooked another one. He is playing this small mouth with a five and one-half foot steel bait rod, one of the most popular lengths.

Certain features with regard to the fittings of the bamboo bait casting rod may be mentioned. Guides are fitted with garnix linings, also agate lining, also in a stainless steel chrome plated. Agate lining is excellent, but the steel guides are now fast coming into prominence. Both agate and garnix guides will crack and break, but steel guides invariably hold their own.

The handle should be of the best grade solid cork and there should most assuredly be a forward grip, that is a grip ahead of the reel. This grip permits of a sure and comfortable hold on the rod. Without it one does not have the proper control over the rod. Again, there should be a finger pull under the reel seat, which the trigger finger can grasp when casting. The value of the finger-pull lies in the ease and sureness with which the rod may be handled. Those rods not fitted with finger-pulls, may have detachable ones slipped on. However, most bait casting rods now are supplied with these pulls.

Bamboo rods generally come in single enamel, six strip construction. Double built rods involve the lamination of two pieces of the outer or fibrous enamel of the bamboo, and cutting V-shaped strips from the same,

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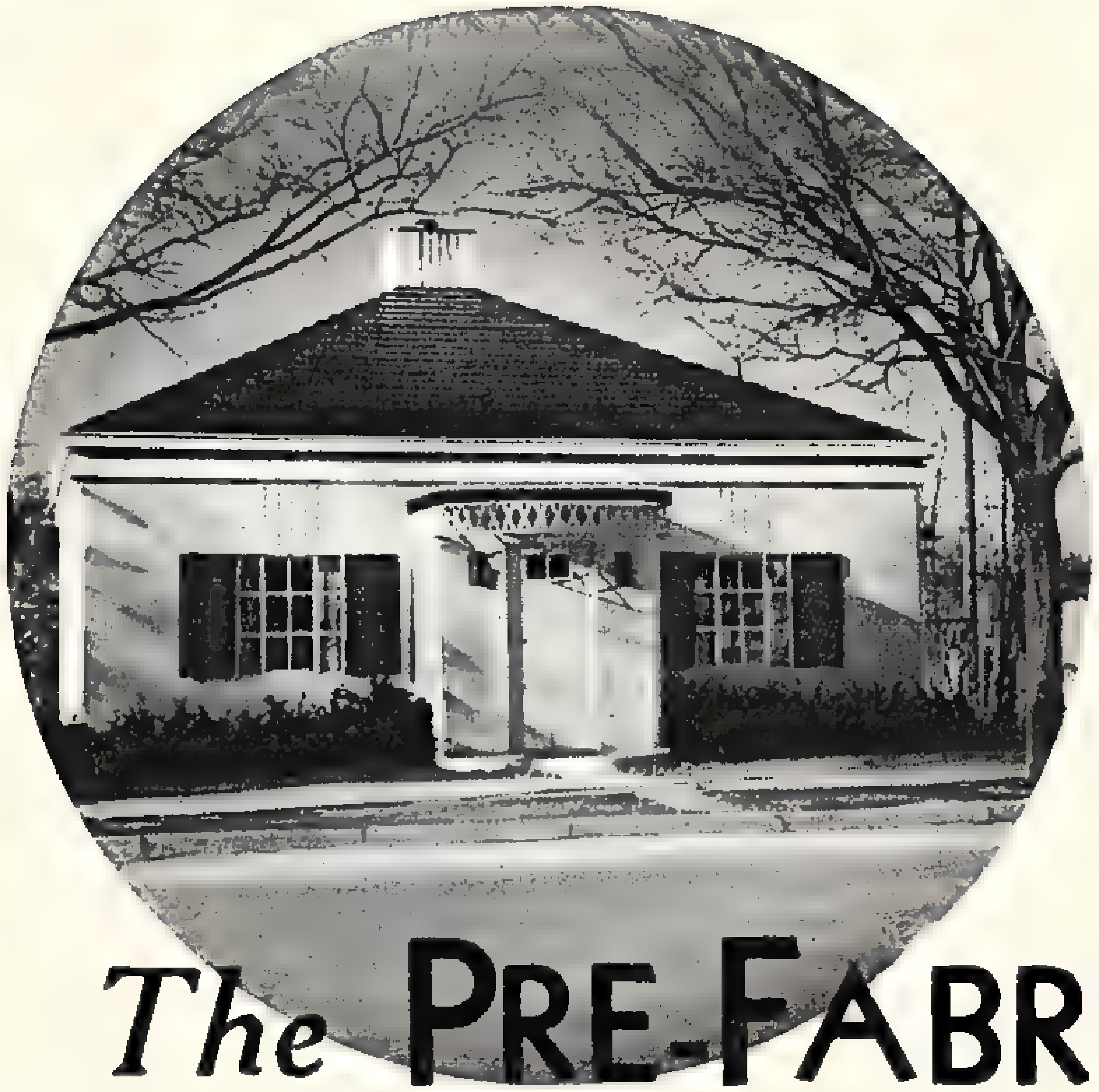
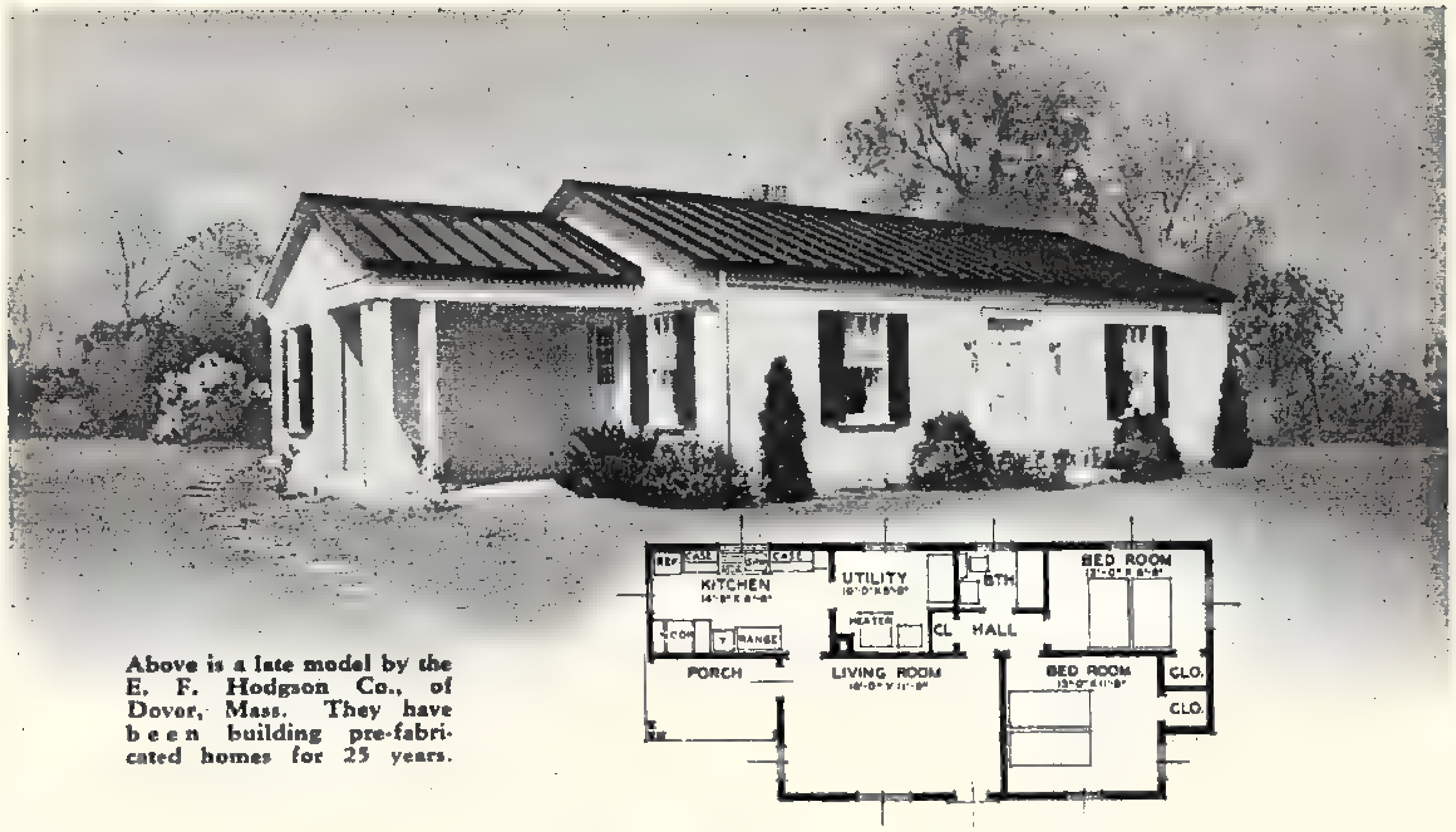


A miracle home, swiftly made and erected by modern Science, is the pre-fabricated house, Industry's most-needed invention for home seekers. Presto! factory-made panels become dream castles. Truly, these pages reflect the creative spirit of America's progress.

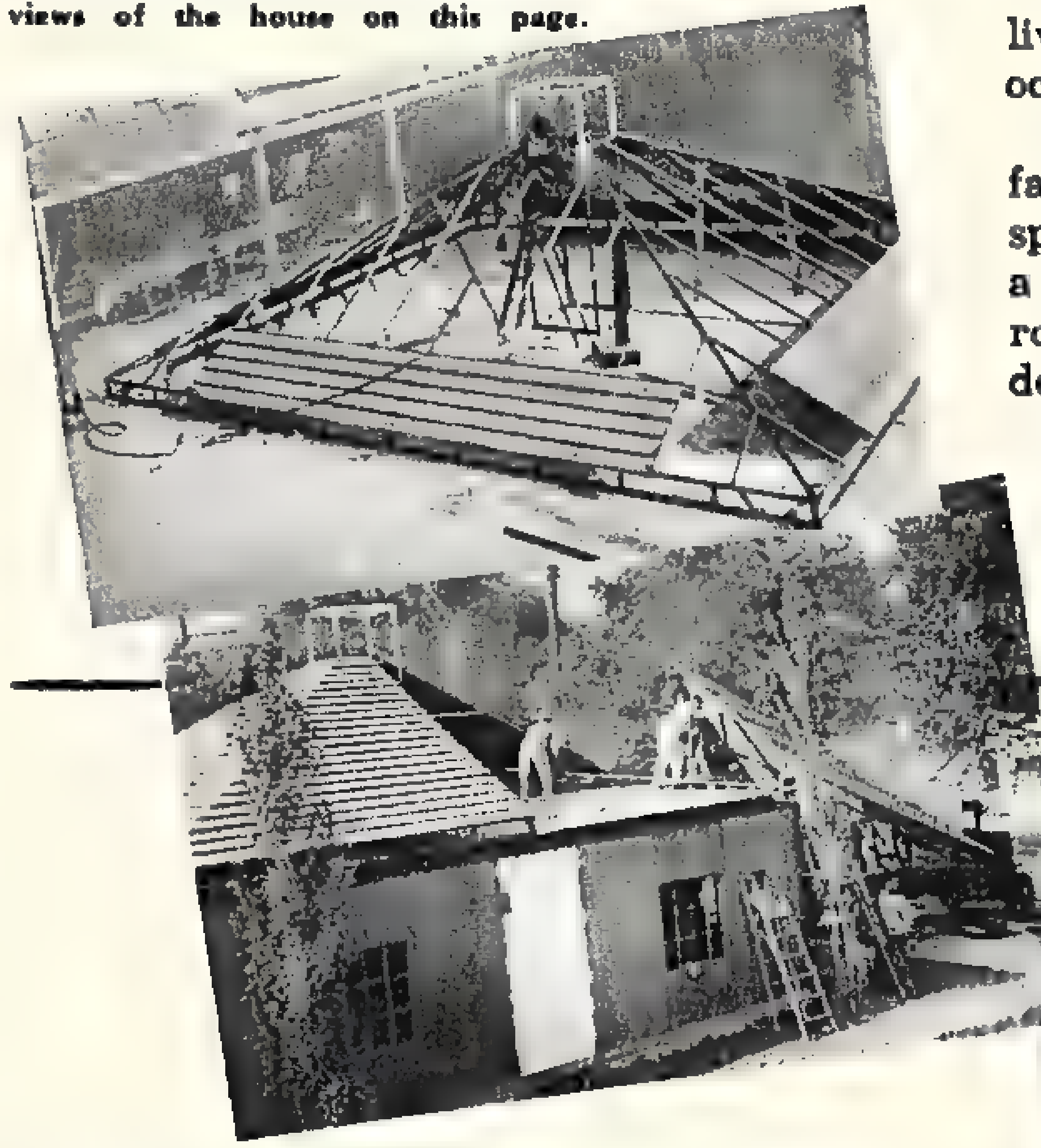
by
DONALD
G. COOLEY



Above is a late model by the E. F. Hodgson Co., of Dover, Mass. They have been building pre-fabricated homes for 25 years.

The PRE-FABRICATED HOUSE ARRIVES

The house above, featured by the Hobart Brothers, of Troy, Ohio, is a 5-room, arc-welded steel house, costing about $3,600. There are other views of the house on this page.



At the factory (see picture over the one just above) the hip roof is arc-welded into four portable sections and shipped by rail or truck. This type of roof gets away from average "box type" house, heretofore so objectionnable to builders. Above—The roof portions are lifted from the truck and assembled on top of the house. Circle—Note the artistic layout of the interior of the house and how the living room merges into the dining room without the use of doors. It is a model of simplicity, even to the placing of the glass-topped steel furniture, the mirror and also, the drapes.

"GIVE me a living room, bath, kitchen and two bedrooms. Wrap them up and deliver them in time to assemble my home for occupancy the first of the month."

The scene is the display room of a pre-fabricated house manufacturer, and the speaker is Mr. Average Man out shopping for a new home. He has just made his choice of rooms from a wide variety displayed on the demonstration floor. The manufacturer will deliver the pre-fabricated units from his warehouse—wrapped in a cellophane package, if he has a flair for the dramatic—and in a week or two the proud new home owner will be able to step into a marvelously efficient house whose cost is well within the limits of a modest income.

It all sounds like one of those intriguing visions of the future which nobody really expects to come true, but the startling fact is that the day of the packaged house is almost here.

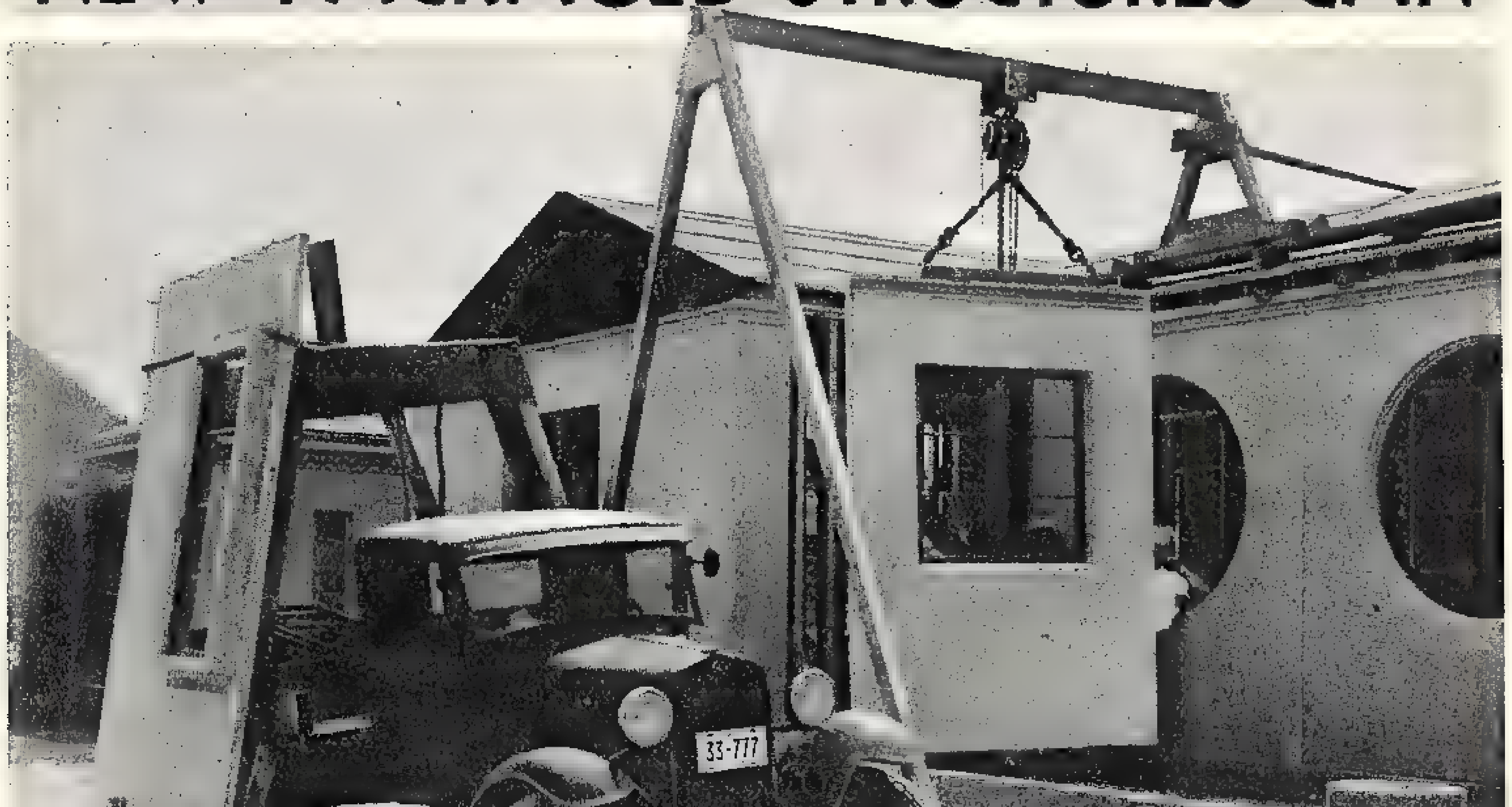
A survey reveals some two dozen companies actively engaged in developing and marketing such houses.

A pre-fabricated house is built up of wall panels turned out in quantity in factories with high-speed machinery. Panels come with doors and windows fitted into them; even plumbing pipes and electric outlets can be built in at the factory. The plumber, electrician, and plasterer are to a large extent eliminated.

What will the pre-fabricated house look

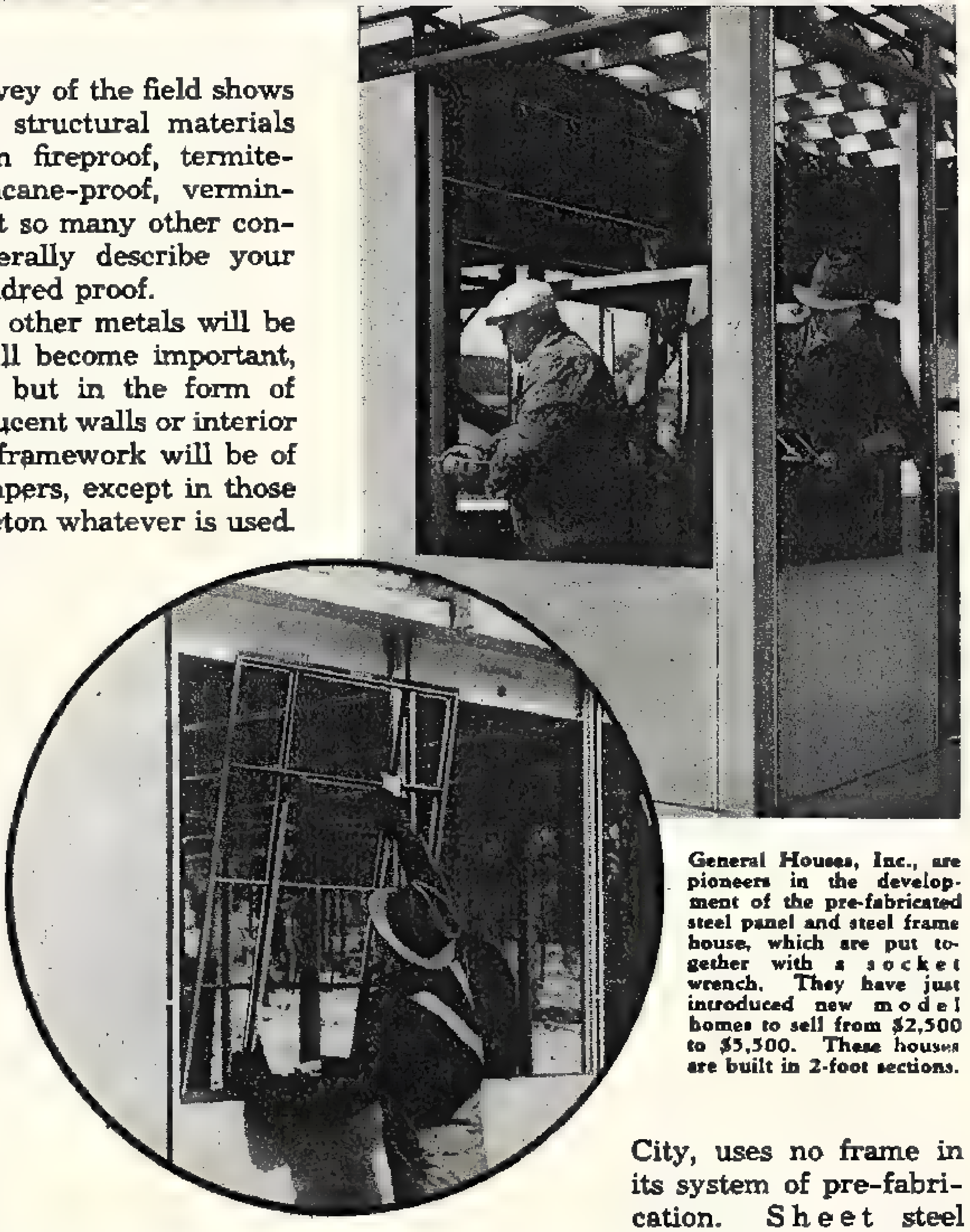
This little dream house in the pines is what many yearn for, and is another artistic model by Hodgson. The owner of an unencumbered lot valued at $1,000 can erect a pre-fabricated house with a cash payment as low as $375, with the remainder at an average rate of $23.53, including fire insurance and taxes.

NEW PACKAGED STRUCTURES CAN BE ASSEMBLED ON SHORT NOTICE



The photograph illustrates how fast the factory-made house can be put together, once the foundation is laid. It shows the simplicity of setting into place a pre-cast panel of Earley Process Mosaic Concrete. Panels are anchored by a novel engineering device that creates a perfect, waterproof structure.

Circle—The house built of copper is rather expensive, but it has the advantage of lasting indefinitely. A blow on the house will not result in a metallic ring, as one would imagine, because insulation between copper walls absorbs the sound.



General Houses, Inc., are pioneers in the development of the pre-fabricated steel panel and steel frame house, which are put together with a socket wrench. They have just introduced new model homes to sell from $2,500 to $3,500. These houses are built in 2-foot sections.

like when it is unwrapped from its package? There is as yet nothing like a standardized form, and probably never will be, but in general the packaged home will be square-cut, free from gables, turrets and complicated ornaments, modernistic in general outline. Wood will give way almost completely to metal. The framework will be of steel, except where panels are used which supply their own frames.

Walls will be amazingly thin and well insulated, with a corresponding increase in usable floor space. Costly basements will be eliminated. Heating and air-conditioning equipment operates cleanly and silently enough to be placed on the ground floor. Windows will be opened with cranks like those in automobiles. Plaster walls will disappear in favor of metals or processed plastics. The interior arrangement of rooms can even be altered after the house is assembled, for inside partitions have no part in supporting the house. Flat roofs will be generally favored, adapted as sun decks and actually affording an additional outdoor room.

And how much will it all cost? You can buy the pre-fabricated units for a two bedroom, living room, kitchen and store room house for as little as $1,050, and you can range upward to $15,000. In general, what the average man regards as an average house will cost around $4,000 from any one of several pre-fabricators.

The ultimate aim is to supply homes to those family groups who cannot afford more than $2,500 for a house. The Roosevelt administration, actively attacking the pressing problem of low-cost housing, estimates that 90 per cent of our population falls within this income bracket. A survey of the field shows an amazing variety of structural materials obtainable, all of them fireproof, termite-proof, rainproof, hurricane-proof, vermin-proof, and proof against so many other contingencies you can literally describe your house as being one hundred proof.

Steel, aluminum and other metals will be widely used. Glass will become important, not only for windows but in the form of hollow bricks for translucent walls or interior partitions. The house framework will be of steel, just as in skyscrapers, except in those versions where no skeleton whatever is used. In this category fall pre-cast concrete panels, and channeled steel panels which themselves support the house. One company is experimenting with plastics—the material out of which the caps for toothpaste tubes are pressed—for use as structural panels. Such a house would literally come out of the chemist's test tube!

Already in production is the Motohome of American Houses, Inc., of New York City. This firm turns out a wall panel made of a cement and asbestos mixture compressed into a slab 2¼ inches thick—which is the thickness of the completed wall, since insulation is provided by the panel itself. It is claimed that the panel never requires painting and that ageing in the weather improves it until it reaches a hardness exceeding that of limestone.

The panels are four feet wide and ten feet high, and come in three standard units—a blank panel, a window panel, and a door panel. These are supported by a steel frame. Spun glass is used beneath the roof for insulation. Cost is said to be 16% less than for the same amount of usable space in traditional-type houses.

National Houses, Inc., also of New York City, uses no frame in its system of pre-fabrication. Sheet steel panels are used for the outer and inner walls, separated by a four-inch space which is packed with a special insulating material known as "vermiculite," which is essentially powdered mica. Four inches of it give the insulating efficiency of a fifty-inch stone wall. The panels are simply bolted together and the exterior surface sprayed with marble dust, giving a fine-grain stucco-like finish of great durability.

This design was developed by William Van Alen, architect of the Chrysler building in New York, which made history in skyscraper design by having its top 18 stories finished in stainless steel. A four-room National House with garage costs around $4,000, the garage representing $300 of this cost. This company also offers sloping roofs at the option of the

[*Continued on page* 122]

PLASTICS REVOLUTIONIZE AMERICAN INDUSTRY

Out of Test Tubes Come Man-Made Products Smashing Traditional Fabrication Methods and Making Cheaply Available Shining Articles of Surpassing Utility.

by

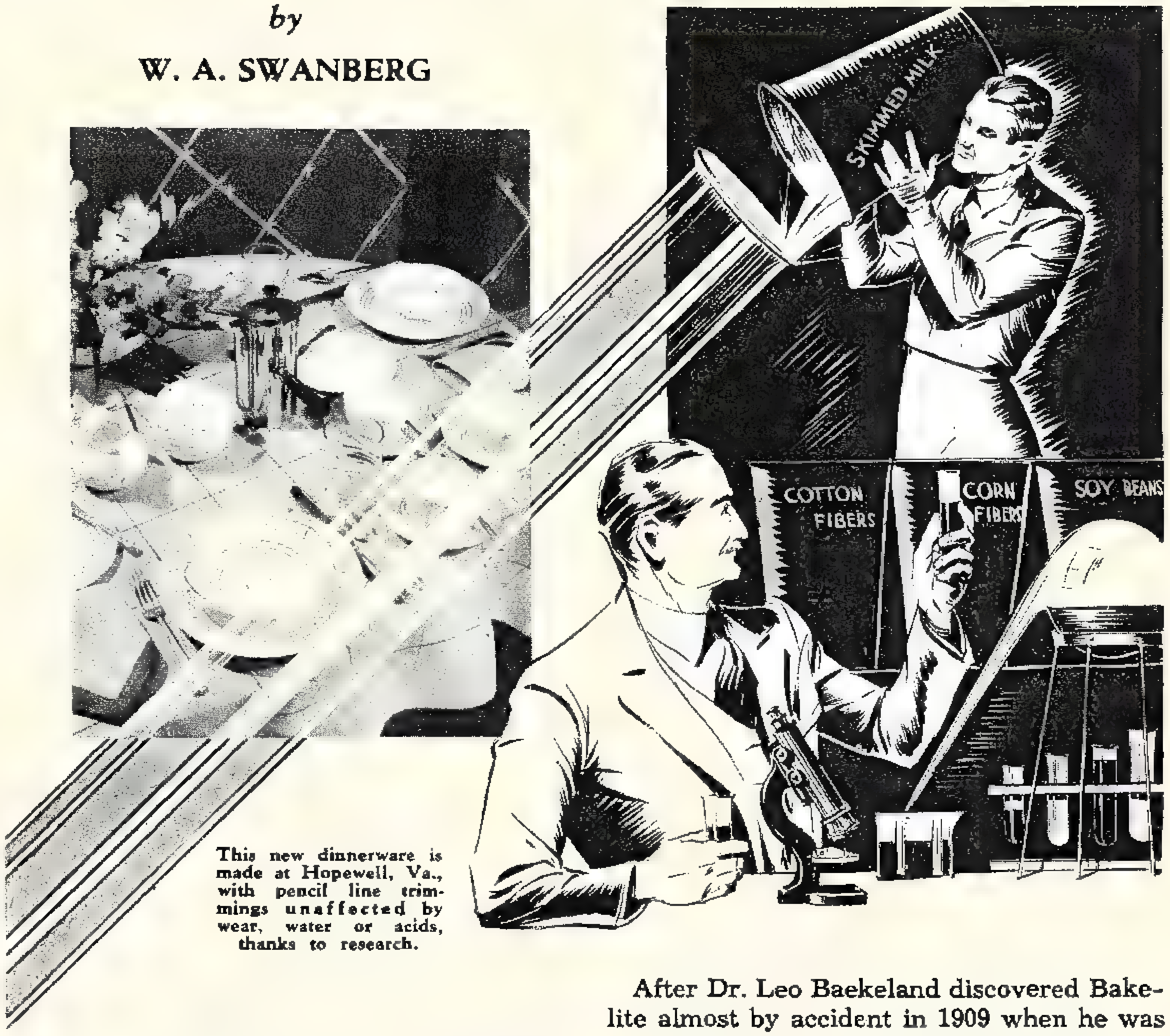
W. A. SWANBERG

An ancient game is now played with pieces of a new material. These chessmen are made of Catalin, one of a score of the new plastics brightening life.

The material beneath the dishes is washable Fabrikoid. The Remington knives have handles of Dupont rubber. The worker below is forcing Catalin into desired forms.

AS THRILLING as any Polar exploration is the day-by-day chemistry in America's laboratories. Here intrepid men with test tubes and beakers forge into the vast uncharted lands of science. More money is spent in this ceaseless venture than was ever dreamed of by Byrd or Stefansson. The cost is reckoned in millions—even, as with radium, in human life—but the gains are worth the battle. For out of this pioneering comes new wonders to revolutionize industry and add comfort and enjoyment to living.

The average American gets up in the morning, switches on the light, shaves, has breakfast, buttons his coat, hops into his car and is off to work. In that short morning hour, usually without realizing it, he has many times made use of a peculiar substance that not so long ago was unknown. That substance is the plastic, a brilliant new child of modern research. The electric light switch is plastic. The razor and its case are probably plastic—as are the handles on the breakfast cutlery, the buttons on the coat, the knobs on the instrument panel of the car. Bright, sturdy and useful articles are all of them—yet they were made from sour milk, from the fuzz of cottonseeds, from carbolic acid or from thin air. All are recent triumphs of the laboratory.



This new dinnerware is made at Hopewell, Va., with pencil line trimmings unaffected by wear, water or acids, thanks to research.

New as they are, plastics have several decades of history behind them. Celluloid, one of the first widely known plastics, is familiar to all; and Bakelite has long been indispensable in telephonic, electric and radio construction. Yet after these had been on the market for years there sprang a new and versatile aggregation of plastics that brought new moldability and workability, new color and more uses. Though of somewhat different formulae, and suited for different uses, all have two things in common. All are plastic—capable of being molded or cast. And all go through the chemical process known as polymerization, in which the molecules of the substance combine by enlargement of molecular structure.

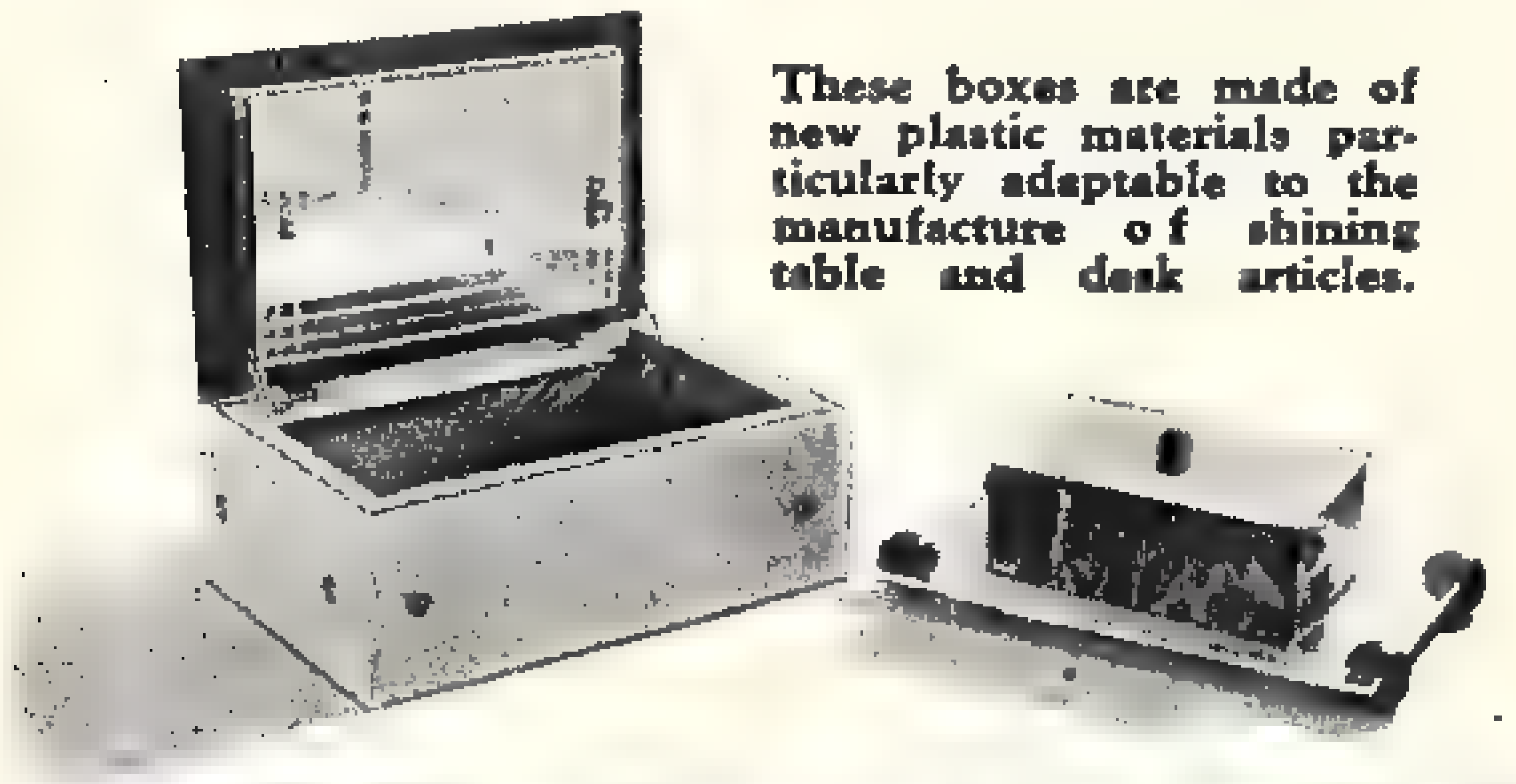
After Dr. Leo Baekeland discovered Bakelite almost by accident in 1909 when he was trying to make a fusible synthetic resin, the creation of new plastics slumped. For years Bakelite and Celluloid were the only important ones used in America, and each had definite limitations. Celluloid, admirable as it was for many uses, was highly inflammable; and Bakelite, despite its utilitarian excellence, could not then come into popular use because of its cost and blackness.

America needed a popular plastic—a substance cheap, fire-resistant, and capable of taking on beautiful colors so that it could be used in the drawing-room as well as the telephone exchange. Not until the last decade did such a product appear.

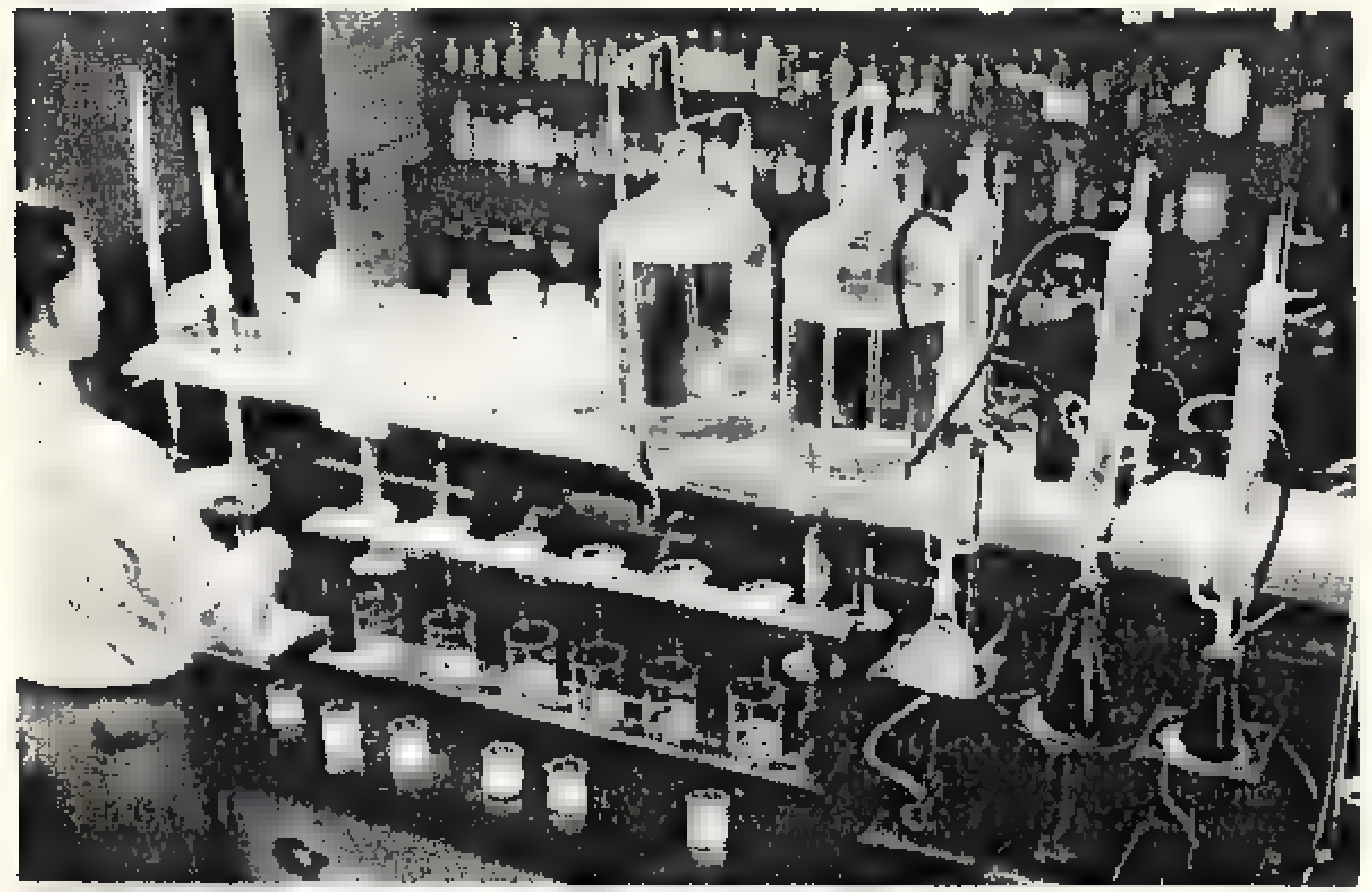
Beetle, Catalin, Durez, Plaskon, Tenite, Resinox, Unyte, and many others—all are new names, all trade names of brilliant plastics made for thousands of uses. Outwardly similar, they are chemically different. Lus-

STARTLING NEW SUBSTANCES REDUCE COSTS IN MANUFACTURING

trous, vari-colored Catalin, for instance, cannot take the place of Bakelite in telephone and radio; nor can black Bakelite replace Catalin in the construction of toilet articles and chessmen, where beauty is needed and dialectricity is not. Roughly, plastic can be divided into three groups: Those made from vegetables, from animal, and from mineral matter.



These boxes are made of new plastic materials particularly adaptable to the manufacture of shining table and desk articles.



A scene in a research laboratory at Newburgh, N. Y. Chemists conduct endless experiments in their quest for new substances for industry.

This Fabrikoid table setting shows possibilities of plastics in several phases of household use. Catalin is shown at the right in forms available to fabricators.

Cellulose—the fiber forming the cell wall of all plants, but found in its purest form in cotton—is the old and the new titan in plastics. From this cheap and plentiful vegetable base came the earlier Celluloid; and it now makes Pyralin, Tenite and cellulose acetate. Though it will burn slowly, cellulose acetate is not highly inflammable as was the older Celluloid. Buyers of Cord, Auburn and Hudson cars this year have steering wheels made of this newest plastic. Sheets of Pyralin one-fiftieth of an inch thick are sandwiched between two thin panes of glass to make modern automobile safety glass. And tough, gleaming Tenite now makes thousands of fountain pen barrels, as well as many other semi-transparent things.

It seems a far cry from cow's milk to buttons, yet chemistry has hurdled the distance. America's button industry—a large producer concentrating on a small but vital product—relies largely on milk for its basic material. Casein, made from milk, is chemically combined with formaldehyde to form a lustrous plastic that is giving buttons a more prominent place in wearing apparel.

Mineral plastics are composed chiefly of phenol (carbolic acid) combined with formaldehyde. Of these the well-known Bakelite and a few others are *molded* into desired shapes, are black in color, and therefore are largely restricted for industrial use. Others such as Catalin are made from similar basic materials but are *cast* into sheets, rods and tubes of brilliant colors. This bulk stock can be fabricated by cutting or by turning on an ordinary lathe, resulting in colorful cutlery handles, knobs and novelties.

Among the most useful of the phenol plastics is the laminated type, such as Formica, in which canvas or other fabric is pressed into the material for greater strength and insulation. Modern motor cars can thank laminated phenolic formaldehyde for a large degree of their quietness. Gears of this substance have widely supplanted steel because they wear remarkably and do not clatter. In the new ocean giant, Queen Mary, too, is $100,000 worth of decorative material made from fire-resistant American Formica.

One of the newest compounds to startle the market is the urea plastic, a mixture of nitrogen—snatched from the air—with carbon dioxide and formaldehyde. Unlike the others this is manufactured first as a powder and is then molded. Grocery scales made by the Toledo Scale Company used to be housed in cumbrous metal that made them weigh 160 pounds. The company substituted Plaskon, a urea plastic, for its metal housings; in so doing it reduced the weight of the scales to 55 pounds and trebled its sales!

Industrial war is the inevitable result of a successful new material. When one considers that many industrial units formerly made of several pieces of metal bolted together can now be molded in one piece of plastic, thus saving the cost of assembly and painting, the answer is obvious.

Yet there are many uses which plastics cannot as yet fill, because of mechanical limitations. Will research remedy that by

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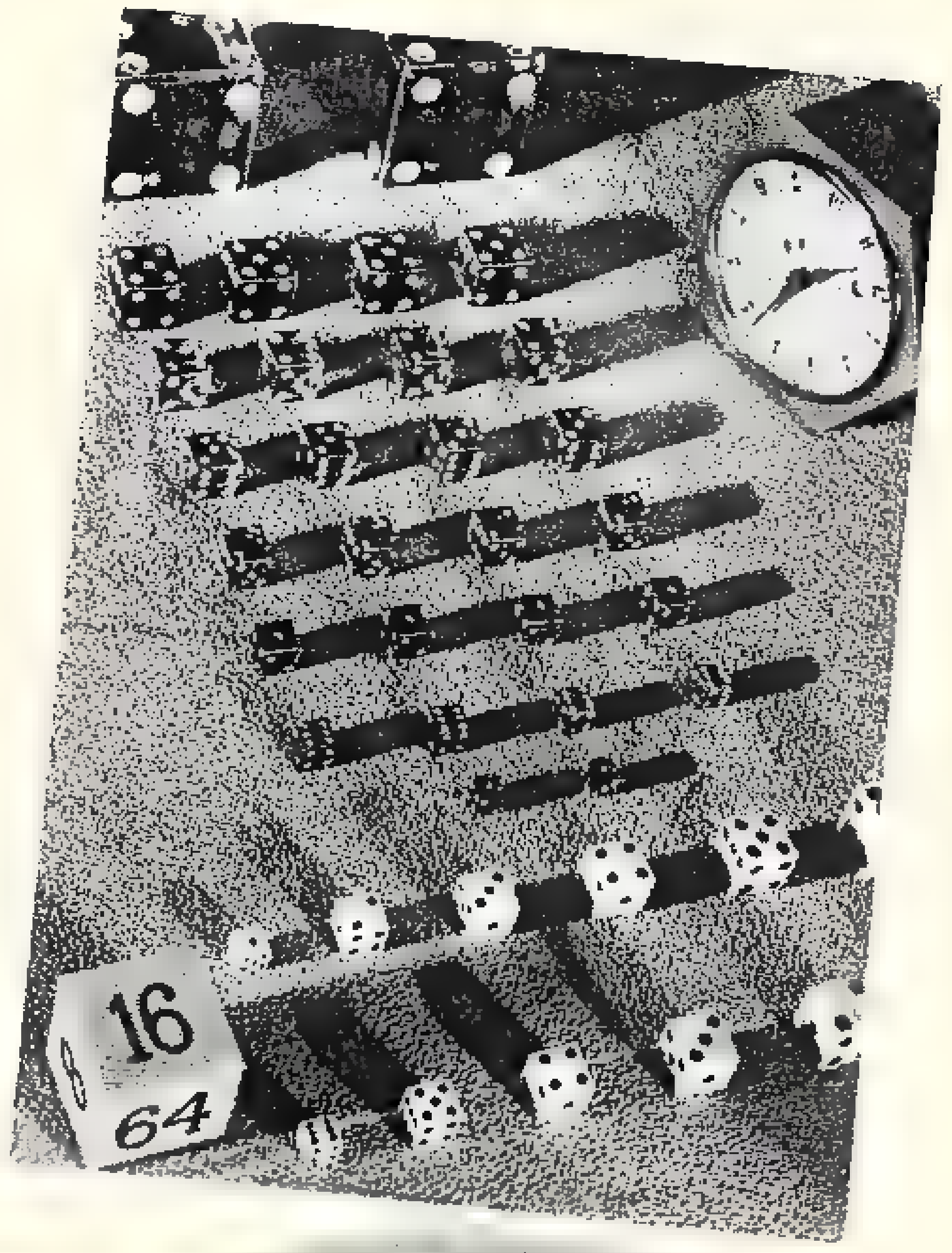
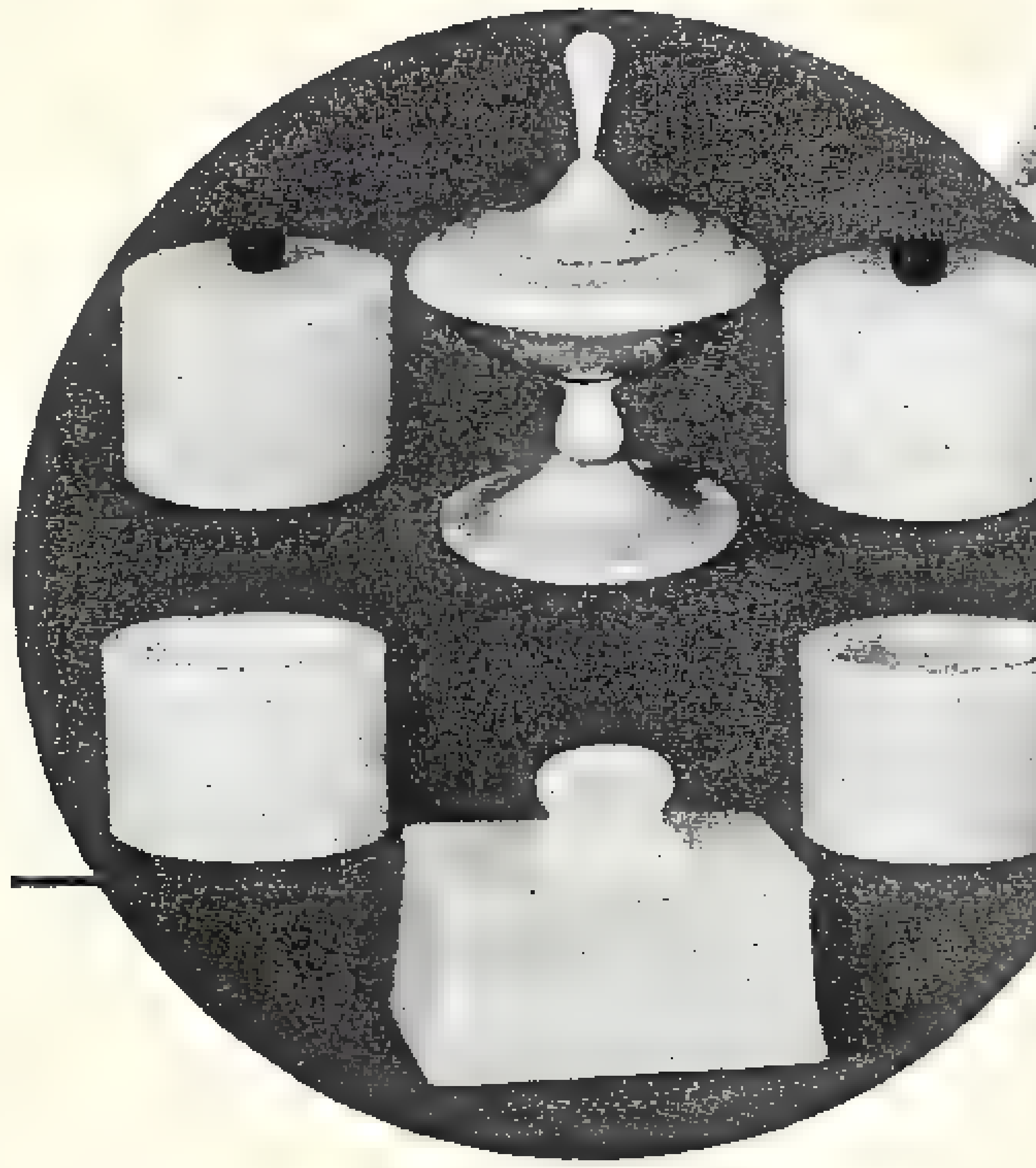
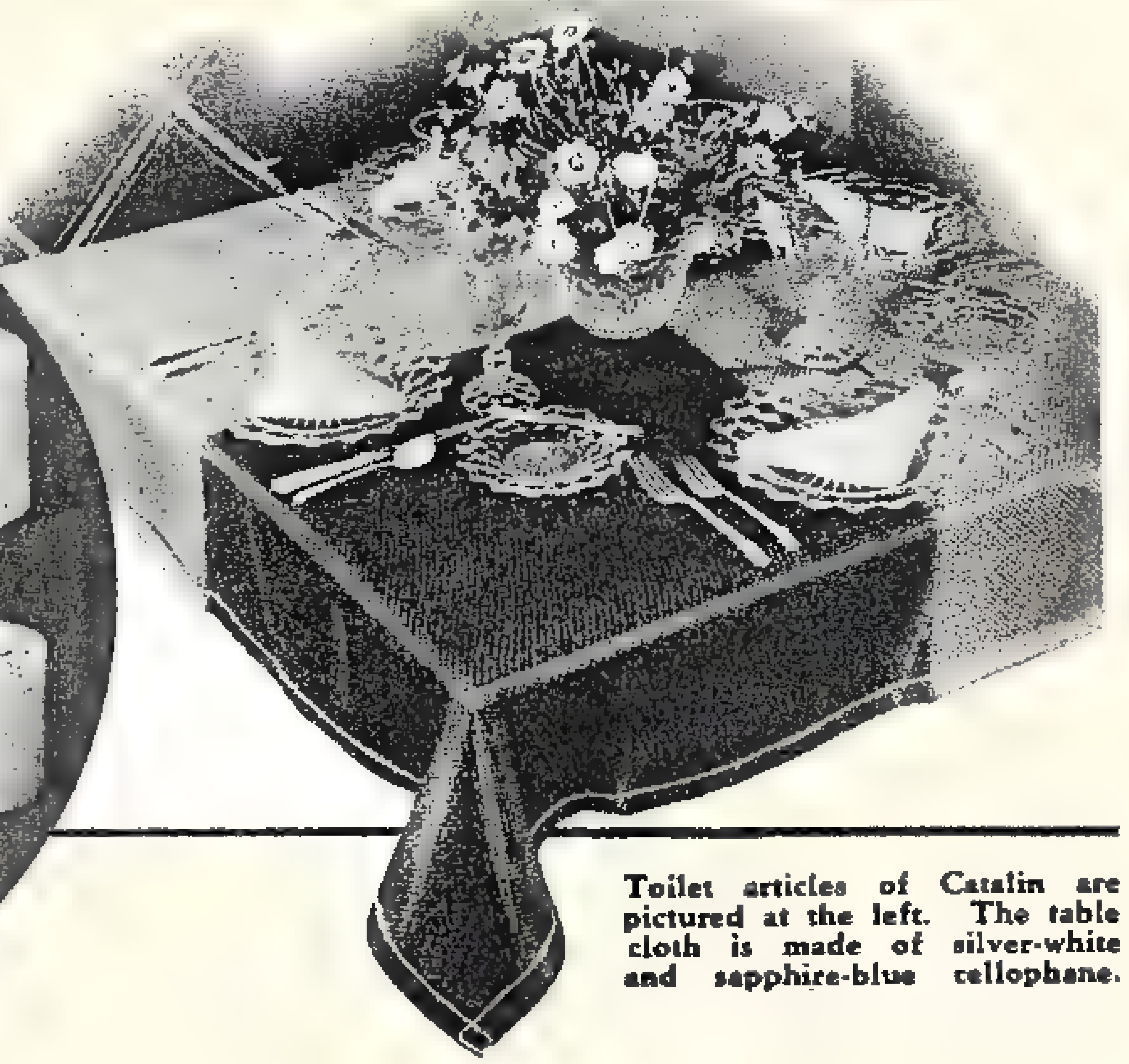
Playtime gadgets of Catalin are shown at the right. They are made of synthetic resin, now widely used in manufacturing. A solution of phenol and formaldehyde is ovencured and shaped.



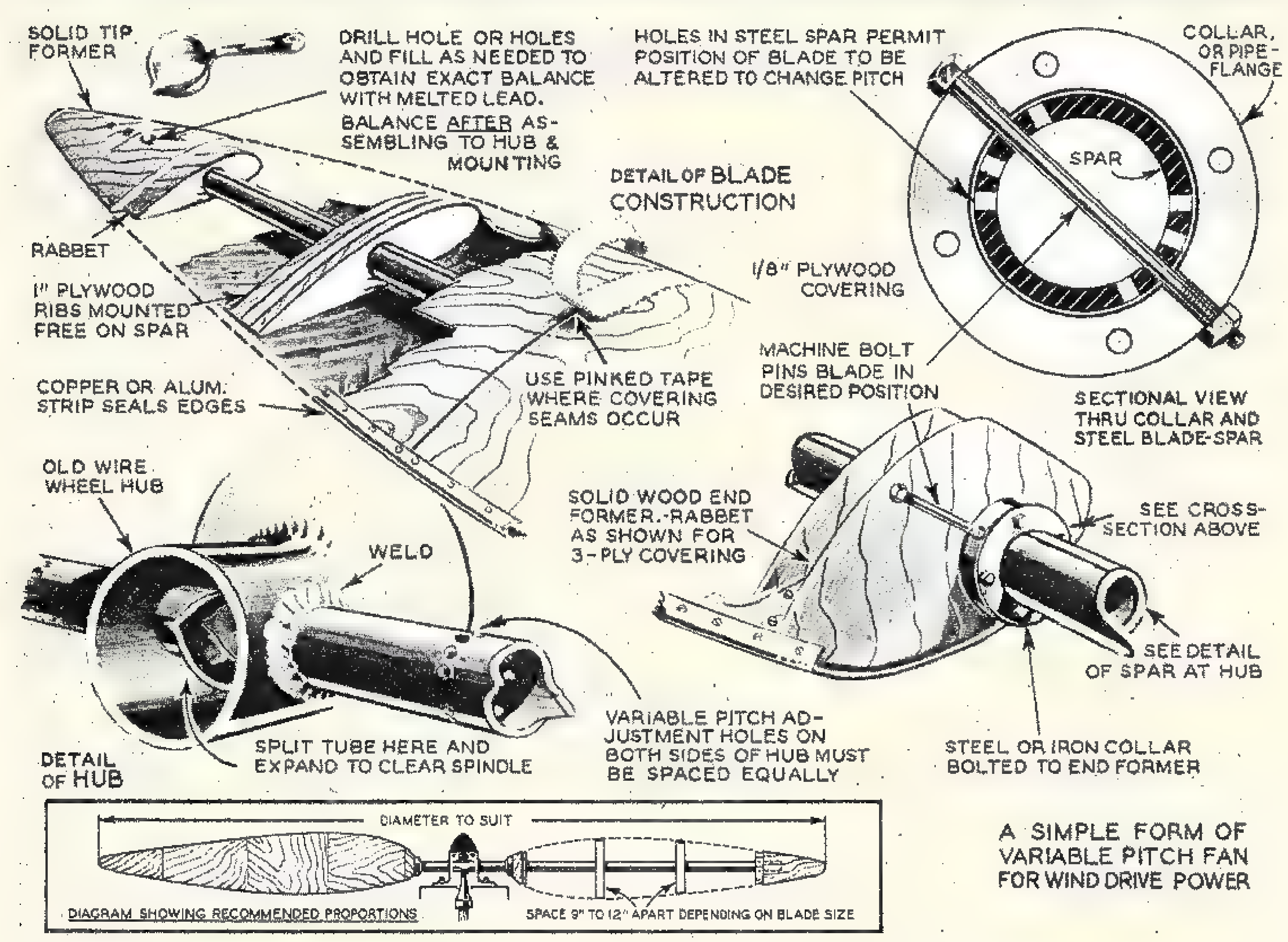




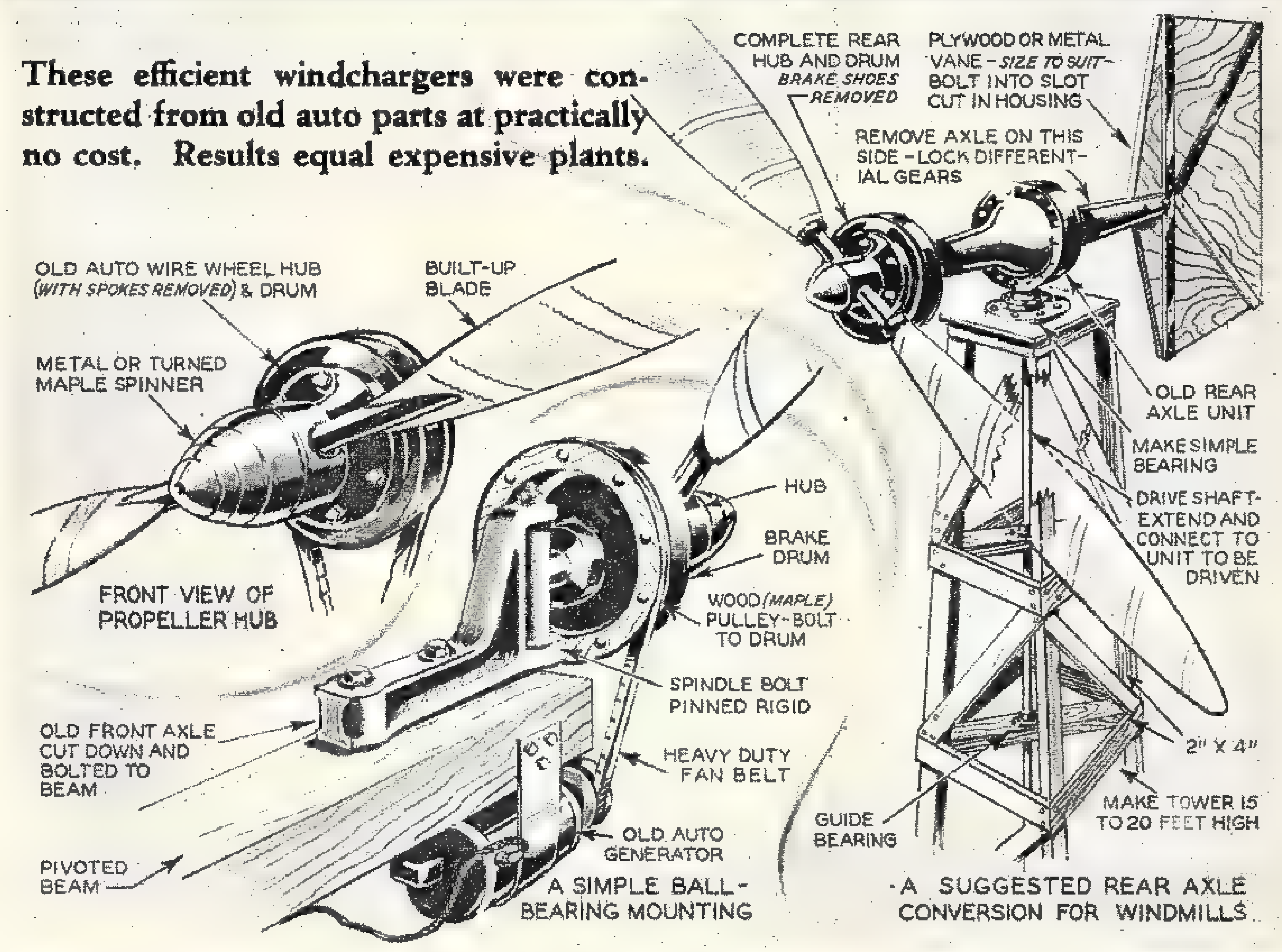
Toilet articles of Catalin are pictured at the left. The table cloth is made of silver-white and sapphire-blue cellophane.

Auto Parts Make Efficient WINDCHARGER Plants

These efficient windchargers were constructed from old auto parts at practically no cost. Results equal expensive plants.


SOLID TIP FORMER
DRILL HOLE OR HOLES AND FILL AS NEEDED TO OBTAIN EXACT BALANCE WITH MELTED LEAD. BALANCE AFTER ASSEMBLING TO HUB & MOUNTING
HOLES IN STEEL SPAR PERMIT POSITION OF BLADE TO BE ALTERED TO CHANGE PITCH
COLLAR, OR PIPE-FLANGE
SPAR
DETAIL OF BLADE CONSTRUCTION
RABBET
1" PLYWOOD RIBS MOUNTED FREE ON SPAR
1/8" PLYWOOD COVERING
MACHINE BOLT PINS BLADE IN DESIRED POSITION
SECTIONAL VIEW THRU COLLAR AND STEEL BLADE-SPAR
COPPER OR ALUM. STRIP SEALS EDGES
USE PINKED TAPE WHERE COVERING SEAMS OCCUR
OLD WIRE WHEEL HUB
WELD
SOLID WOOD END FORMER.-RABBET AS SHOWN FOR 3-PLY COVERING
SEE CROSS-SECTION ABOVE
SEE DETAIL OF SPAR AT HUB
DETAIL OF HUB
SPLIT TUBE HERE AND EXPAND TO CLEAR SPINDLE
VARIABLE PITCH ADJUSTMENT HOLES ON BOTH SIDES OF HUB MUST BE SPACED EQUALLY
STEEL OR IRON COLLAR BOLTED TO END FORMER
DIAMETER TO SUIT
DIAGRAM SHOWING RECOMMENDED PROPORTIONS
SPACE 9" TO 12" APART DEPENDING ON BLADE SIZE
A SIMPLE FORM OF VARIABLE PITCH FAN FOR WIND DRIVE POWER

The propeller blades are constructed from plywood with airplane tubing forming the rigid center core. Spacers placed 9 to 12 inches apart serve as mountings for the plywood covering. If one side of the propeller is too heavy drill holes in the tip of the other blade and fill with melted lead. A copper or aluminum strip seals the edges of the blade and prevents chipping.


COMPLETE REAR HUB AND DRUM BRAKE SHOES REMOVED
PLYWOOD OR METAL VANE - SIZE TO SUIT - BOLT INTO SLOT CUT IN HOUSING
REMOVE AXLE ON THIS SIDE - LOCK DIFFERENTIAL GEARS
OLD AUTO WIRE WHEEL HUB (WITH SPOKES REMOVED) & DRUM
BUILT-UP BLADE
METAL OR TURNED MAPLE SPINNER
OLD REAR AXLE UNIT
MAKE SIMPLE BEARING
DRIVE SHAFT-EXTEND AND CONNECT TO UNIT TO BE DRIVEN
HUB
BRAKE DRUM
FRONT VIEW OF PROPELLER HUB
WOOD (MAPLE) PULLEY-BOLT TO DRUM
SPINDLE BOLT PINNED RIGID
OLD FRONT AXLE CUT DOWN AND BOLTED TO BEAM
HEAVY DUTY FAN BELT
2" X 4"
MAKE TOWER 15 TO 20 FEET HIGH
GUIDE BEARING
OLD AUTO GENERATOR
PIVOTED BEAM
A SIMPLE BALL-BEARING MOUNTING
A SUGGESTED REAR AXLE CONVERSION FOR WINDMILLS

Junked automobile parts are ideal for use in building a sturdy windcharger plant. A front axle cut down and bolted to the pivoted beam makes an ideal propeller mounting. The ball bearing hub of an auto wheel provided with a maple wood pulley is ideal for windcharger use. Mount the generator under the pivoted beam and gear to propeller with "V" belting.

by DOUGLAS P. ROLFE

ONE of the many problems confronting the prospective builder of a wind driven generating plant is the selection of a suitable windmill or propeller. While the flat-bladed, fan type is usually selected by amateur builders there is a strong argument for the airplane type propeller and as a matter of fact it is becoming increasingly popular. In the first place old airplane propellers are fairly easily obtained and are not at all expensive. While in certain instances an old airplane propeller may prove satisfactory there are many more cases where its value is something less than zero.

Many times these propellers are too heavy and have a fixed "pitch" which may be quite unsuited to the prevailing winds of your locality.

This article will proceed to outline the construction of a simple, reasonably light and quite practical "fan" which is built something in the manner they put autogiro vanes together. It can be built by anyone able to use tools and has moreover the answer to your particular "pitch" troubles incorporated in its design!

The first item is a ball bearing hub. This would be expensive and difficult to produce in a home workshop. Fortunately this necessity does not exist as the junk yards are teeming with hubs, and spindles, too, ideally suited for the purpose. Any light car hub and spindle is adaptable although for small units the rear hub from an old motorcycle may be used. As the drawings show, this hub forms the starting point for the wind propeller. The blades, built up of plywood on formers, are spaced along the central spar and are adjustable to provide variation of "pitch." How this is done can be seen quite clearly from the detail diagrams. The central spar or tube may be of iron but it is far better to use a length of steel tube for this. Tubing such as is used in airplane construction is ideal for the purpose. The diameter of the tube is in direct relation to the diameter of the propeller you plan to build. General proportions are shown in the accompanying drawings, although actual constructional details may be varied to suit the builder's own ideas and, to some extent, his materials available. For instance, the blades are adjustable on the spar itself as shown, but two tubes may be employed and attached to the hub in such manner as to permit varying the pitch at this point of attachment if so desired.

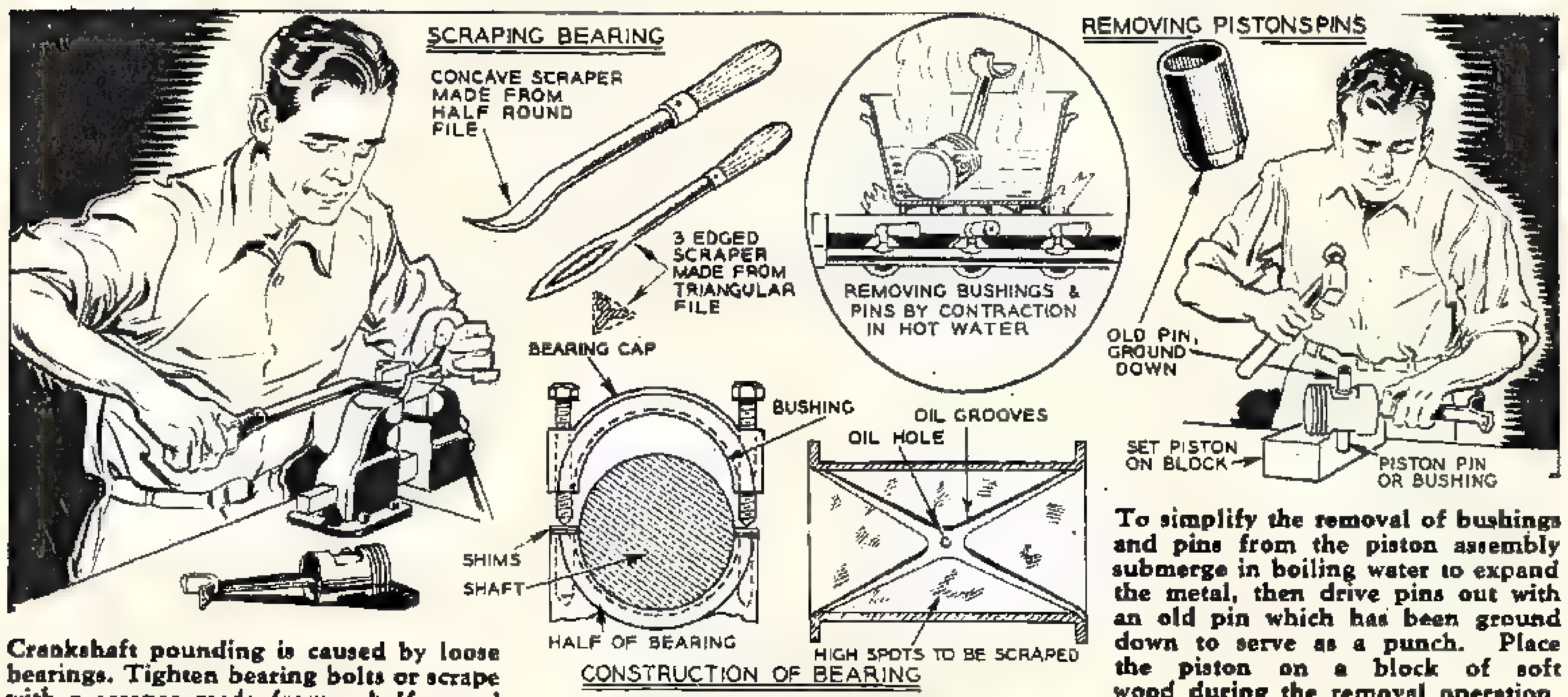
It is assumed that most amateur builders plan on using automobile generators for their wind electric plants. This presupposes some gearing up to insure adequate revolutions in a moderate breeze. To accomplish this a hard wood pulley is attached to the hub with a length of "V" belting to make the connection direct to the standard generator pulley. The hub pulley for best results should be between 8 and 10 inches in diameter. Heavy duty automobile fan belts are excellent for the drive belt.

For really large ambitious wind plants something more substantial is necessary. Many ingenious ideas have been developed and carried out with standard automobile parts.

For a light windcharger plant an old front axle cut down and bolted to the pivoted beam makes an ideal mounting. In this case the wood pulley is bolted to the back of the brake drum with the fan belt connecting to the generator which is mounted directly underneath on a bracket. A plywood vane of suitable size attached to the opposite end of the beam completes the windcharger. For best results the device should be mounted at least twenty feet in the air either on a housetop or tower.

CHECKING the CAR for Elusive Engine NOISES

by MORRIS A. HALL


SCRAPING BEARING
CONCAVE SCRAPER MADE FROM HALF ROUND FILE
3 EDGED SCRAPER MADE FROM TRIANGULAR FILE
BEARING CAP
BUSHING
OIL GROOVES
OIL HOLE
SHIMS
SHAFT
HALF OF BEARING
CONSTRUCTION OF BEARING
HIGH SPOTS TO BE SCRAPED
REMOVING PISTONSPINS
REMOVING BUSHINGS & PINS BY CONTRACTION IN HOT WATER
OLD PIN, GROUND DOWN
SET PISTON ON BLOCK
PISTON PIN OR BUSHING

Crankshaft pounding is caused by loose bearings. Tighten bearing bolts or scrape with a scraper made from a half round file as shown above. Use Prussian blue in the scraping process so that surface is made perfectly round and not oval.

To simplify the removal of bushings and pins from the piston assembly submerge in boiling water to expand the metal, then drive pins out with an old pin which has been ground down to serve as a punch. Place the piston on a block of soft wood during the removal operation.

Until now only the most experienced auto mechanic could track down an elusive motor noise. This article tells how you can easily correct these annoying sounds.

NO MATTER how good an automobile motor may be it will eventually get noisy and begin to lose power. While the power factor is very often ignored the presence of noise is most objectionable.

Crankcase pounding, valve hiss and piston slap are the more common causes for a motor to be noisy and lacking in its power output. While these items appear to involve special processing that can only be attempted by an experienced mechanic, it is possible for anyone with a fair knowledge of automobile construction to correct trouble.

Noise caused by worn bearings can usually be detected by the loud dull sound produced. The same sound is present if they are merely loose, therefore first check for loose bolts and if the trouble is not here take the bearing apart and re-scrape it. A tool for this work can be made from a half round file which has been ground into a concave blade. A similar tool can also be fashioned from a triangular file in the manner made clear by the diagrams. After smoothing off the inside of the bearing sections smear on a thin coat of Prussian blue then re-assemble the unit.

Turn the shaft several times in the bearing, then open the sections. High spots will clearly show up and should be removed so that shaft turns freely.

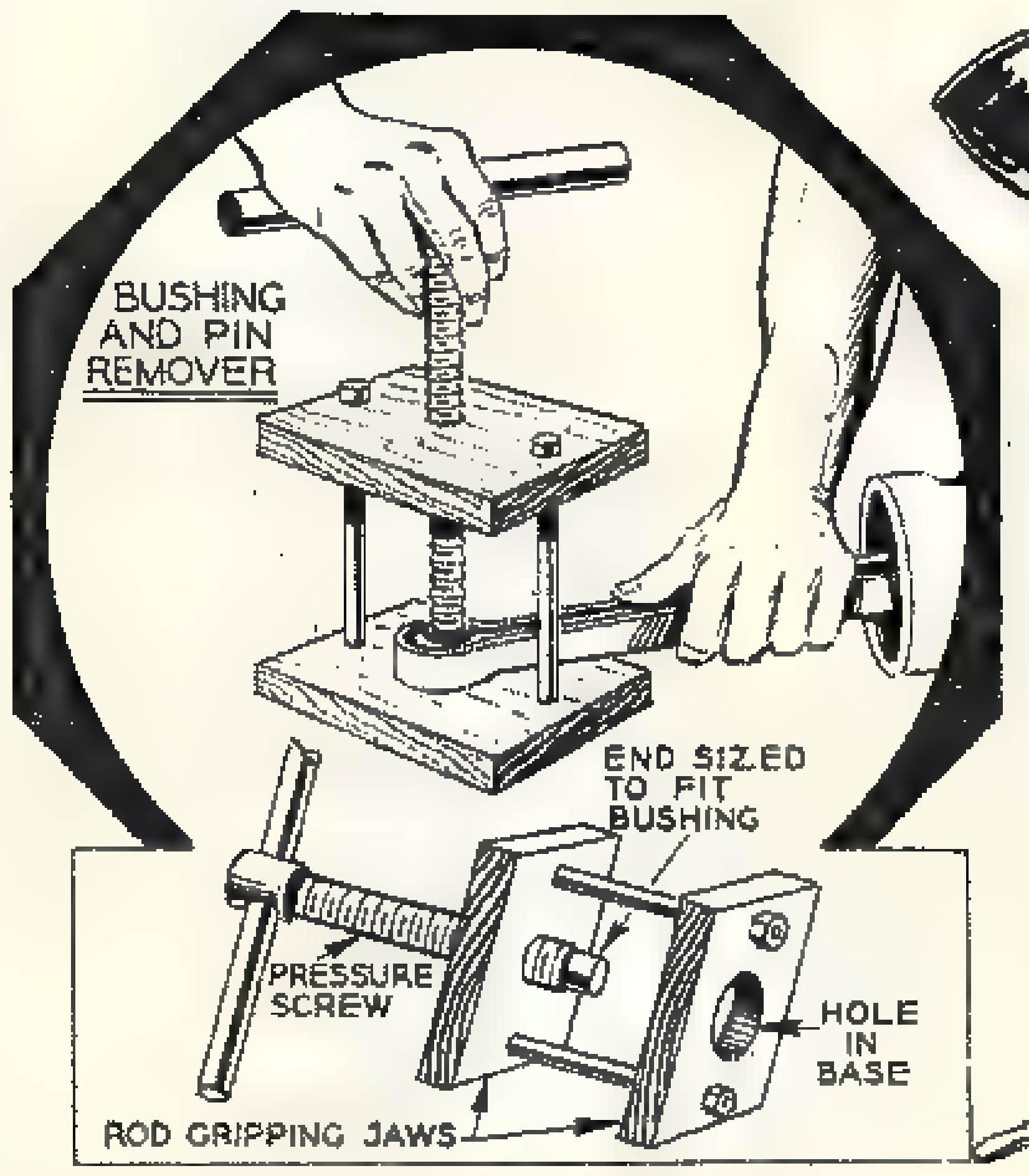
Worn piston pins and piston rod bushings are also responsible for much of the trouble. An old pin ground down makes a handy tool for removing piston pins. A simple screw device similar to the one illustrated on this page will aid in the removal of worn bushings. Placing the entire piston in boiling water for several minutes will expand the outer metal sufficiently so that pins and bushings will come out easily.

Where the piston rings have caused the cylinder walls to wear rough, re-boring is necessary. For this work the proper hand drill attachments should be used to insure a perfectly true surface. When re-boring, grind out the cylinder to the first oversize and secure piston rings to fit so that there is no leakage of power.

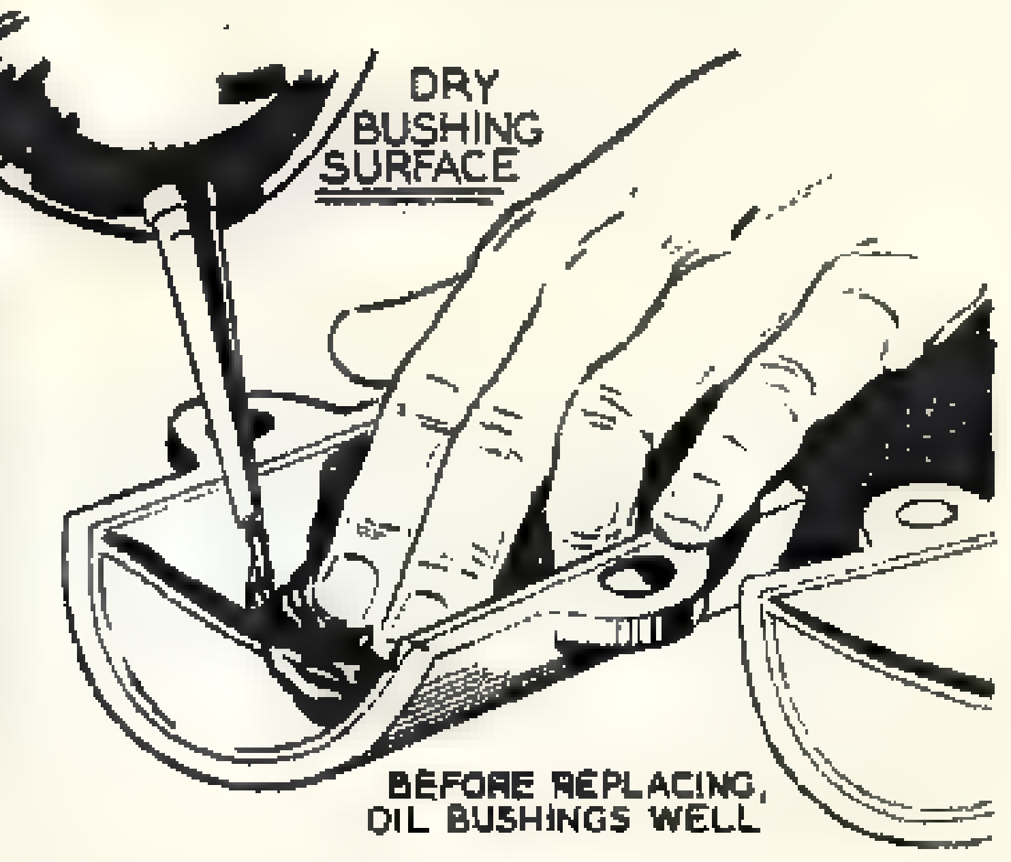
It is easy to find the exact cause for the particular noise your car has developed by using a simple cylinder trouble detector. Secure an old auto pump and install a double washer plunger on the shaft, then fit up the end of the pump with a connection threaded to fit a spark plug tap. When a cylinder is suspected remove the plug, screw on the pump then turn over the engine until the pump handle is forced upward. By removing the pan and allowing someone to hold the rod a loose piston can be immediately detected.

In assembling the pistons be sure to lubricate the surfaces of the bearing well by applying heavy oil to the inner surfaces and smoothing out with the finger tips. The bear-

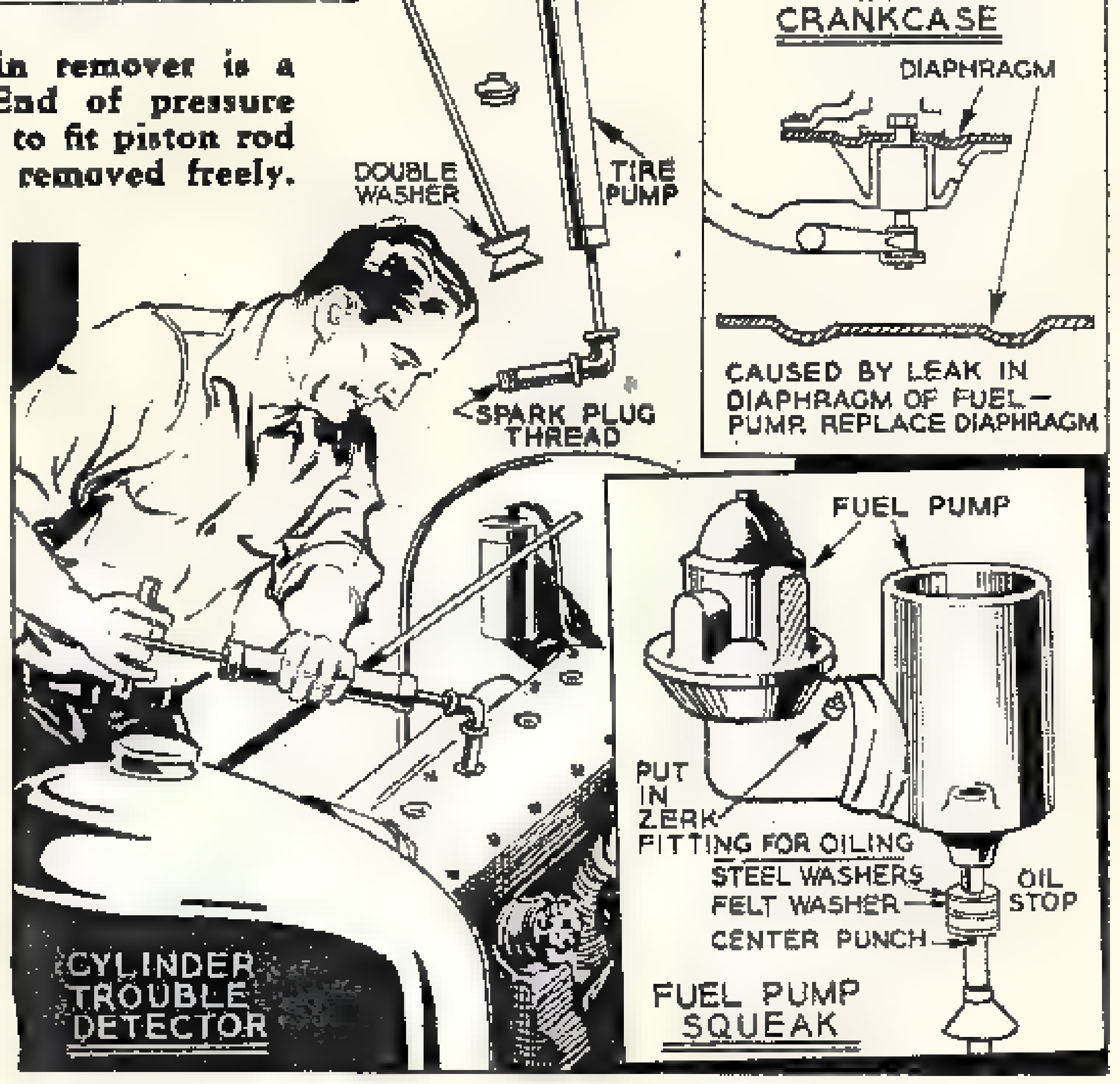
[Continued on page 126]


BUSHING AND PIN REMOVER
END SIZED TO FIT BUSHING
PRESSURE SCREW
HOLE IN BASE
ROD GRIPPING JAWS

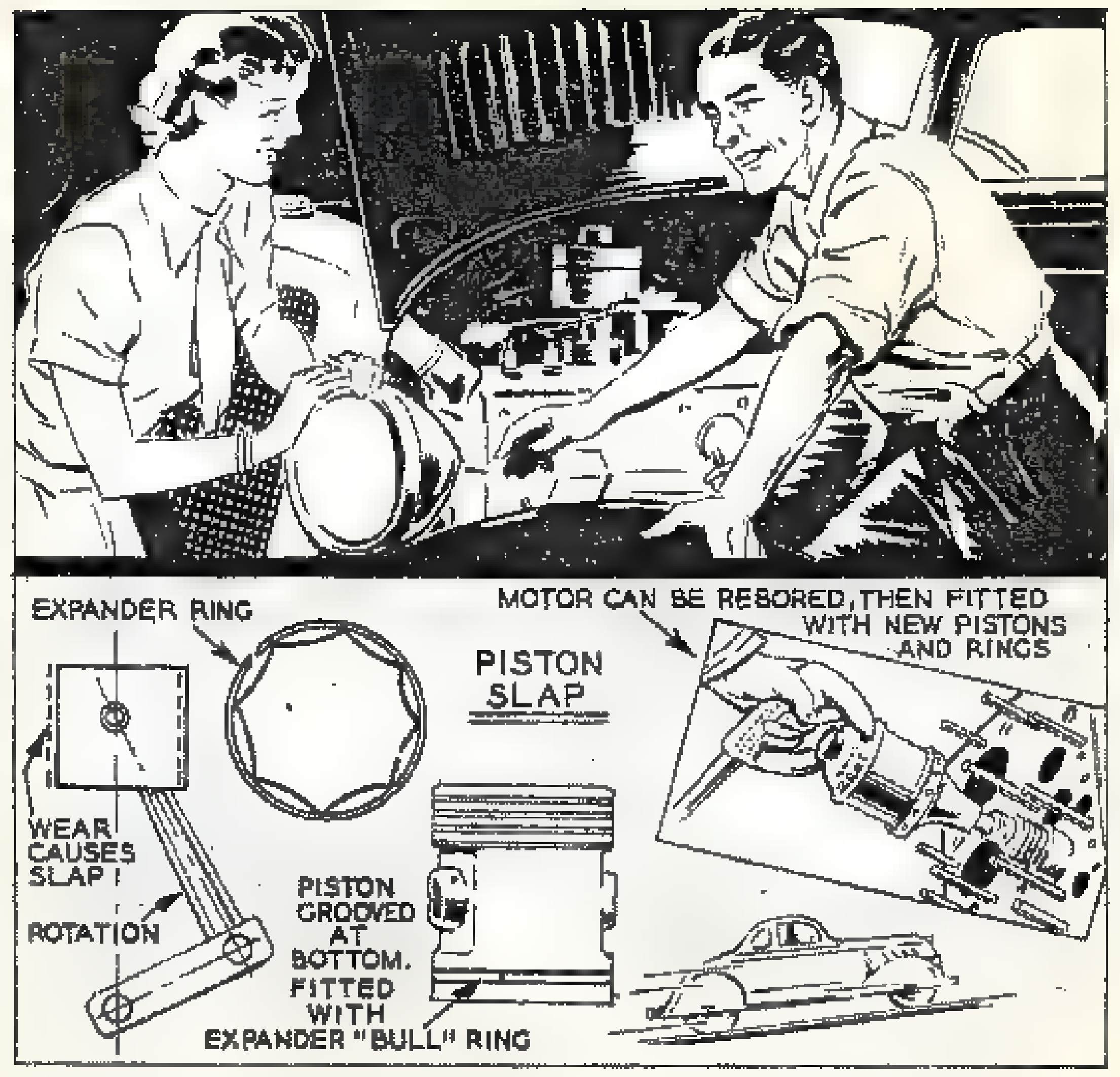
This bushing and pin remover is a handy piston tool. End of pressure screw should be sized to fit piston rod bushing so it may be removed freely.


DRY BUSHING SURFACE
BEFORE REPLACING, OIL BUSHINGS WELL

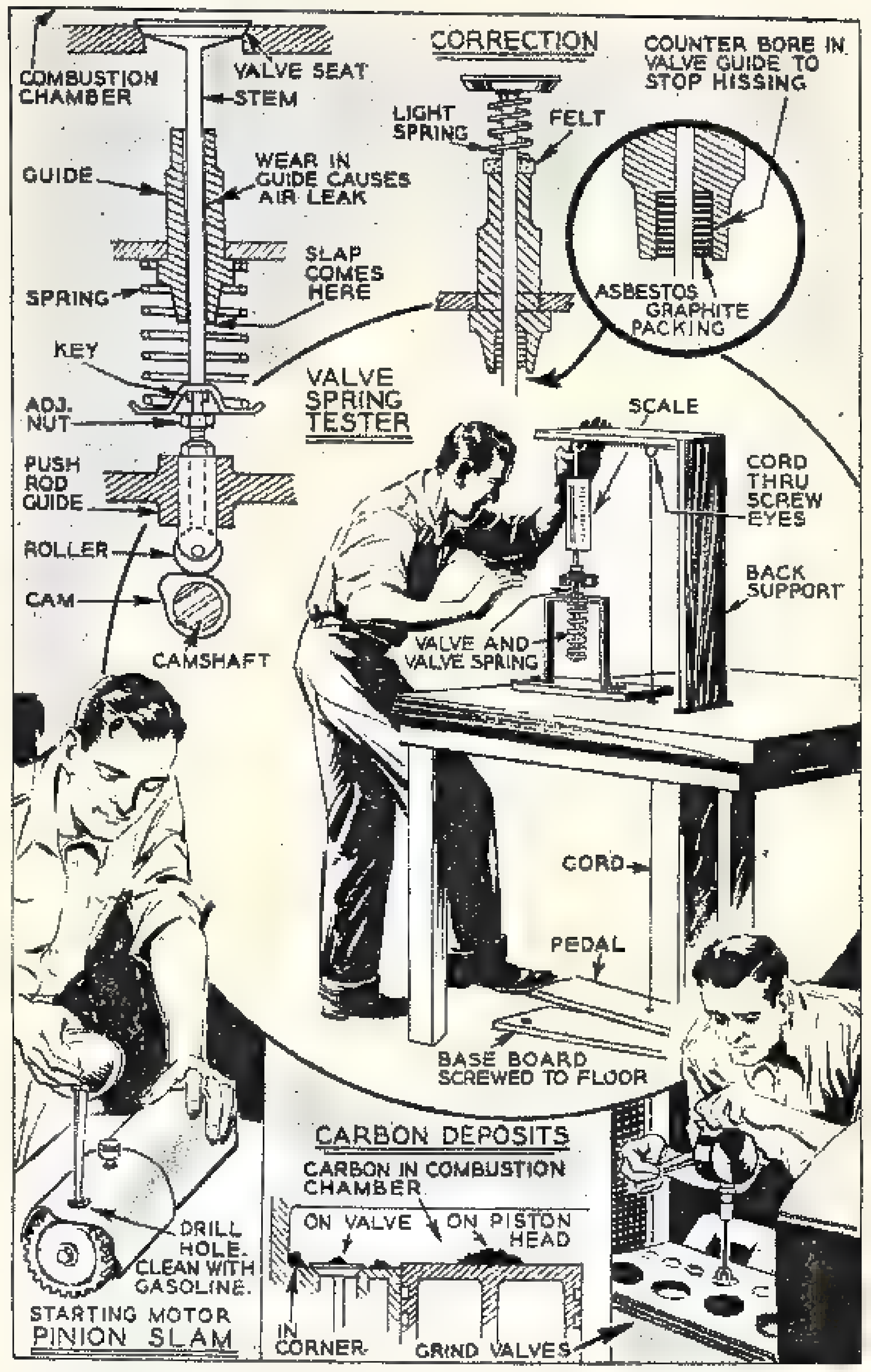
After completing the scraping of a bushing it should be well lubricated, oil being spread out with finger tips. This completed, bushing may be assembled.


DOUBLE WASHER
TIRE PUMP
SPARK PLUG THREAD
GASOLINE IN CRANKCASE
DIAPHRAGM
CAUSED BY LEAK IN DIAPHRAGM OF FUEL-PUMP. REPLACE DIAPHRAGM
FUEL PUMP
PUT IN ZERK FITTING FOR OILING
STEEL WASHERS
FELT WASHER
CENTER PUNCH
OIL STOP
FUEL PUMP SQUEAK
CYLINDER TROUBLE DETECTOR

A handy cylinder trouble detector for locating piston knocks and similar noises can be made from an old tire pump provided with double washers and threaded reducer to fit spark plug taps. Fuel pump squeaks can be eliminated as shown.


EXPANDER RING
MOTOR CAN BE REBORED, THEN FITTED WITH NEW PISTONS AND RINGS
PISTON SLAP
WEAR CAUSES SLAP!
ROTATION
PISTON GROOVED AT BOTTOM. FITTED WITH EXPANDER "BULL" RING

Piston slap is often due to one side of the cylinder wall being worn down. The only correction for this trouble is to re-bore all cylinders to the first oversize and use new oversize piston rings. The above diagram shows the cause for pistons to slap.


COMBUSTION CHAMBER
VALVE SEAT
STEM
GUIDE
WEAR IN GUIDE CAUSES AIR LEAK
SLAP COMES HERE
SPRING
KEY
ADJ. NUT
PUSH ROD GUIDE
ROLLER
CAM
CAMSHAFT
CORRECTION
LIGHT SPRING
FELT
COUNTER BORE IN VALVE GUIDE TO STOP HISSING
ASBESTOS GRAPHITE PACKING
VALVE SPRING TESTER
SCALE
CORD THRU SCREW EYES
BACK SUPPORT
VALVE AND VALVE SPRING
CORD
PEDAL
BASE BOARD SCREWED TO FLOOR
CARBON DEPOSITS
CARBON IN COMBUSTION CHAMBER
ON VALVE
ON PISTON HEAD
IN CORNER
GRIND VALVES
DRILL HOLE. CLEAN WITH GASOLINE.
STARTING MOTOR PINION SLAM

All valves must have a uniform spring tension if the motor is to perform efficiently. Springs may be quickly checked on the simple spring balance device shown above. The proper adjustment of the valve tension can be determined by referring to the cross section diagram illustrated at upper left. Asbestos-graphite packing in the counter bore will eliminate valve hiss. The starter motor mechanism should never be oiled. Instead plain gasoline should be squirted into mechanism from time to time. A small hole drilled in motor housing permits access to starter spring and the unbalanced pinion for pouring gas.

PULL-CORD CONTROL OPENS GARAGE DOORS Automatically

HERE'S a simple, automatic garage door control with which you may close your garage doors as you drive out and open them without leaving the car when you are ready to drive in.

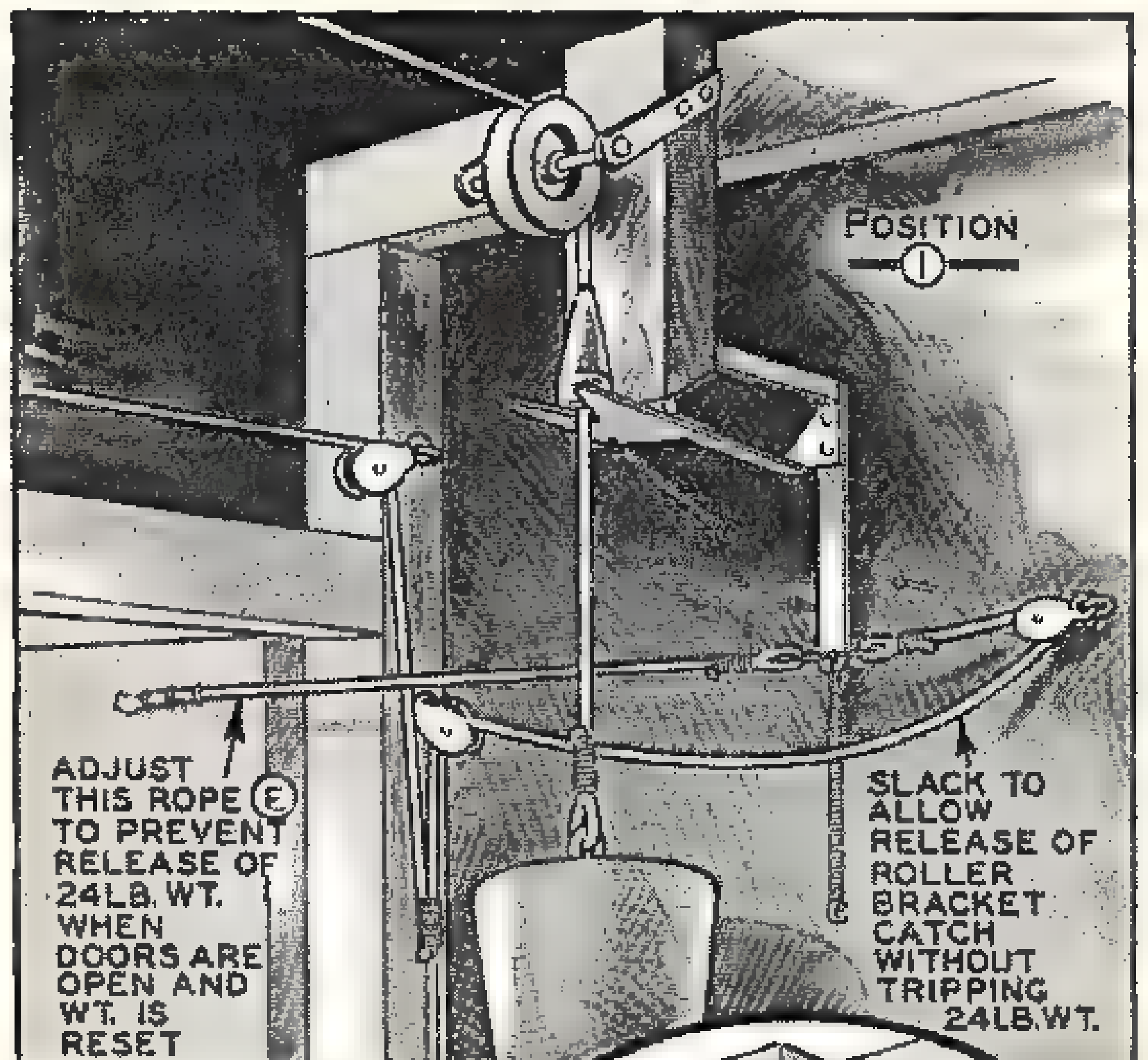
The illustrations explain clearly, the construction of the various mechanisms required in the construction.

When the doors of the garage are closed, a pull on the control rope "A" releases the 24-pound weight as in Position 2. The weight opens the doors and the catch on the stationary beam engages the first roller bracket on the movable beam which holds the doors firmly in a wind. The catch on the stationary beam is placed so that the movable beam will project about 18 inches beyond the door frame in full open position.

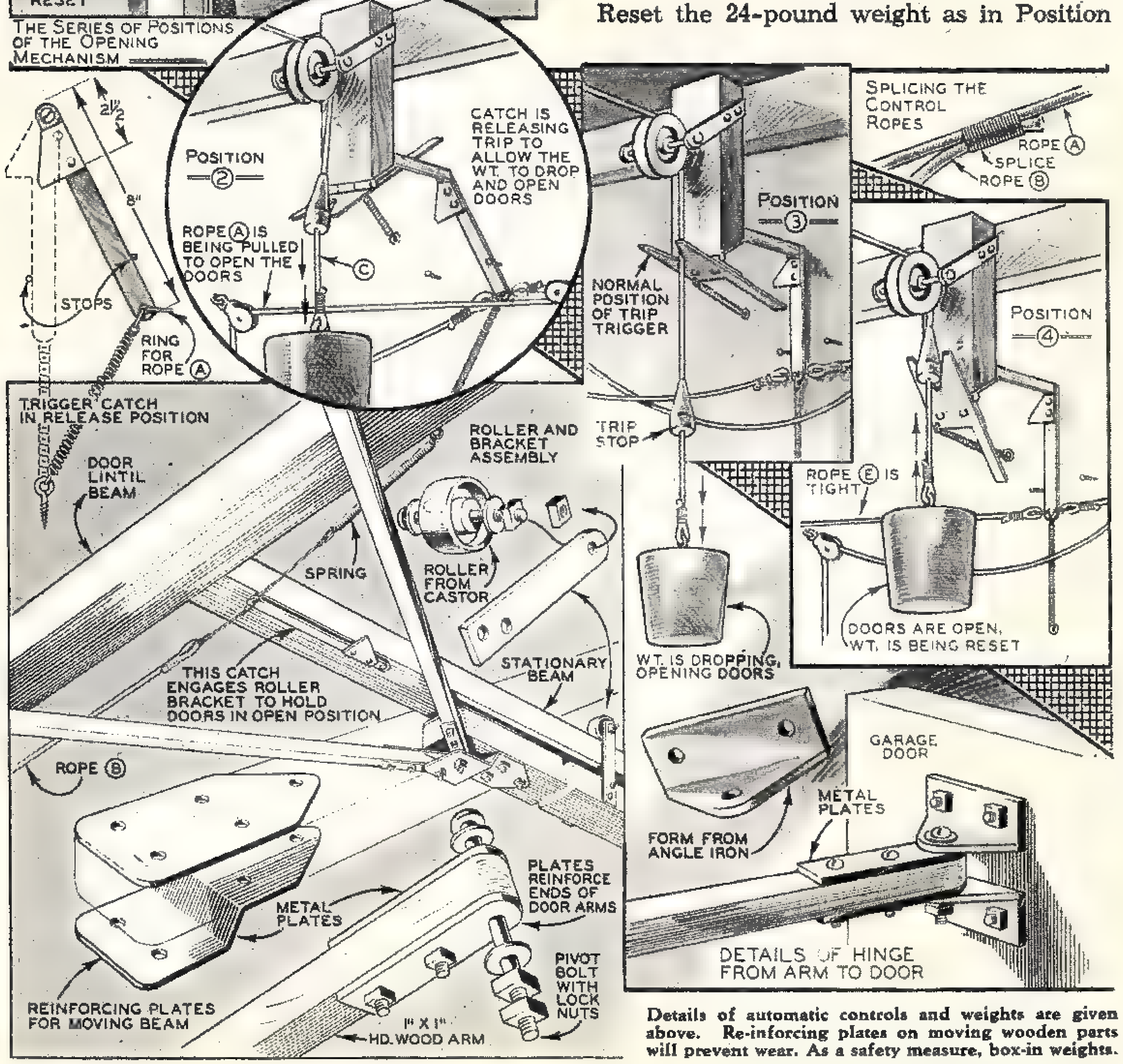
Reset the 24-pound weight as in Position 1 then drive the car out of the garage. A pull on the control rope "A" will release the catch holding the doors open, and the 11-pound weight will close the doors by its pull on the rope "D." Rope "B" is spliced to rope "A" at the proper point to make this operation possible. It should be noted that while the doors are open, a pull on the control rope "A" will release the catch on the stationary beam, but rope "E" prevents the release of the trigger catch controlling the drop of the 24-pound weight.

You will not find it necessary to leave the car to operate the control from the time you drive out of the garage until you have driven the car into it again.

Always remember to reset the 24-pound weight each time you leave the garage, whether you are driving in or out.

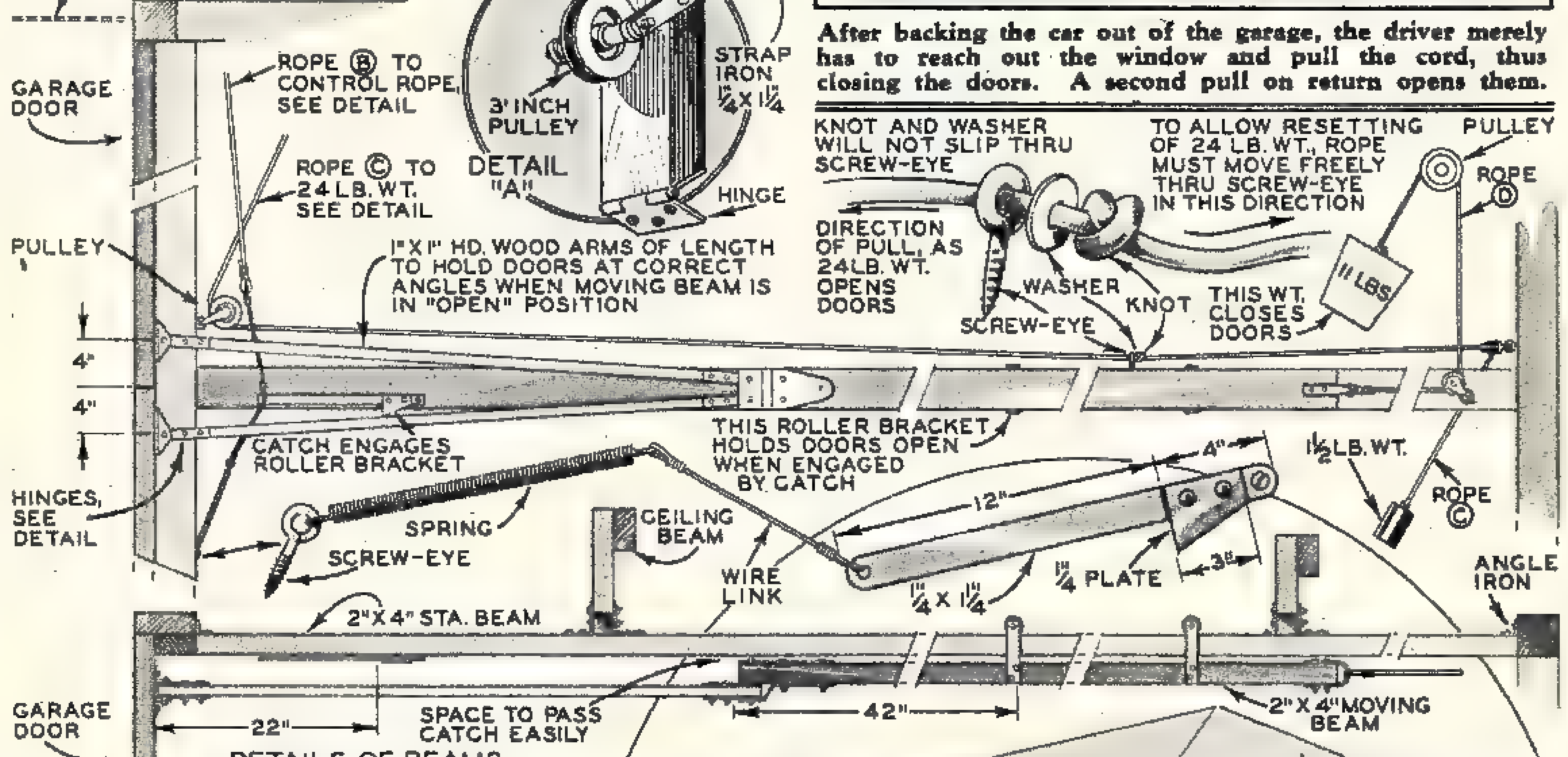

POSITION ①
ADJUST THIS ROPE Ⓔ TO PREVENT RELEASE OF 24LB.WT. WHEN DOORS ARE OPEN AND WT. IS RESET
SLACK TO ALLOW RELEASE OF ROLLER BRACKET CATCH WITHOUT TRIPPING 24LB.WT.

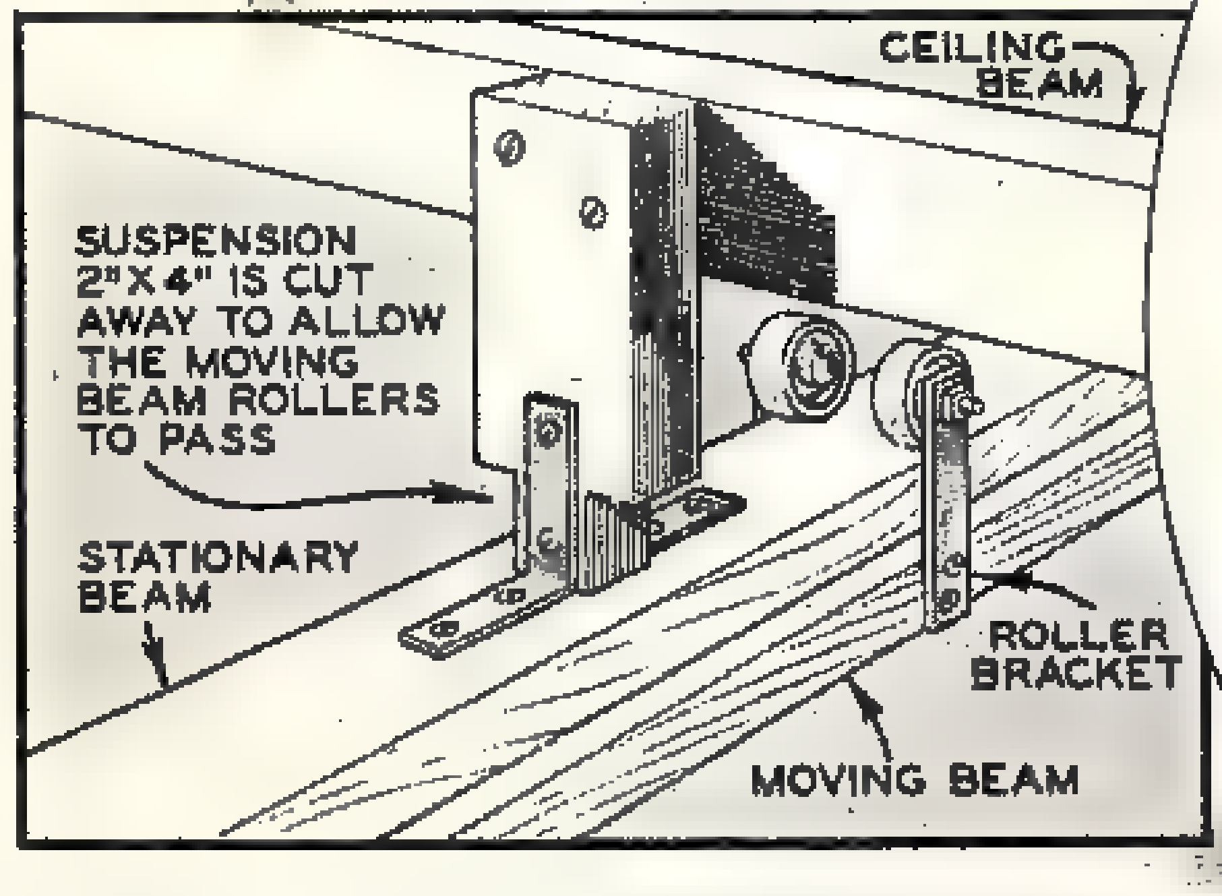
THE SERIES OF POSITIONS OF THE OPENING MECHANISM


2½
8"
STOPS
RING FOR ROPE Ⓐ
TRIGGER CATCH IN RELEASE POSITION
DOOR LINTIL BEAM
SPRING
POSITION ②
ROPE Ⓐ IS BEING PULLED TO OPEN THE DOORS
Ⓒ
CATCH IS RELEASING TRIP TO ALLOW THE WT. TO DROP AND OPEN DOORS
POSITION ③
NORMAL POSITION OF TRIP TRIGGER
TRIP STOP
WT. IS DROPPING, OPENING DOORS
POSITION ④
ROPE Ⓔ IS TIGHT
DOORS ARE OPEN, WT. IS BEING RESET
SPLICING THE CONTROL ROPES
ROPE Ⓐ
SPLICE
ROPE Ⓑ
ROLLER AND BRACKET ASSEMBLY
ROLLER FROM CASTOR
STATIONARY BEAM
THIS CATCH ENGAGES ROLLER BRACKET TO HOLD DOORS IN OPEN POSITION
ROPE Ⓑ
METAL PLATES
REINFORCING PLATES FOR MOVING BEAM
PLATES REINFORCE ENDS OF DOOR ARMS
PIVOT BOLT WITH LOCK NUTS
1" X 1" HD. WOOD ARM
FORM FROM ANGLE IRON
METAL PLATES
GARAGE DOOR
DETAILS OF HINGE FROM ARM TO DOOR

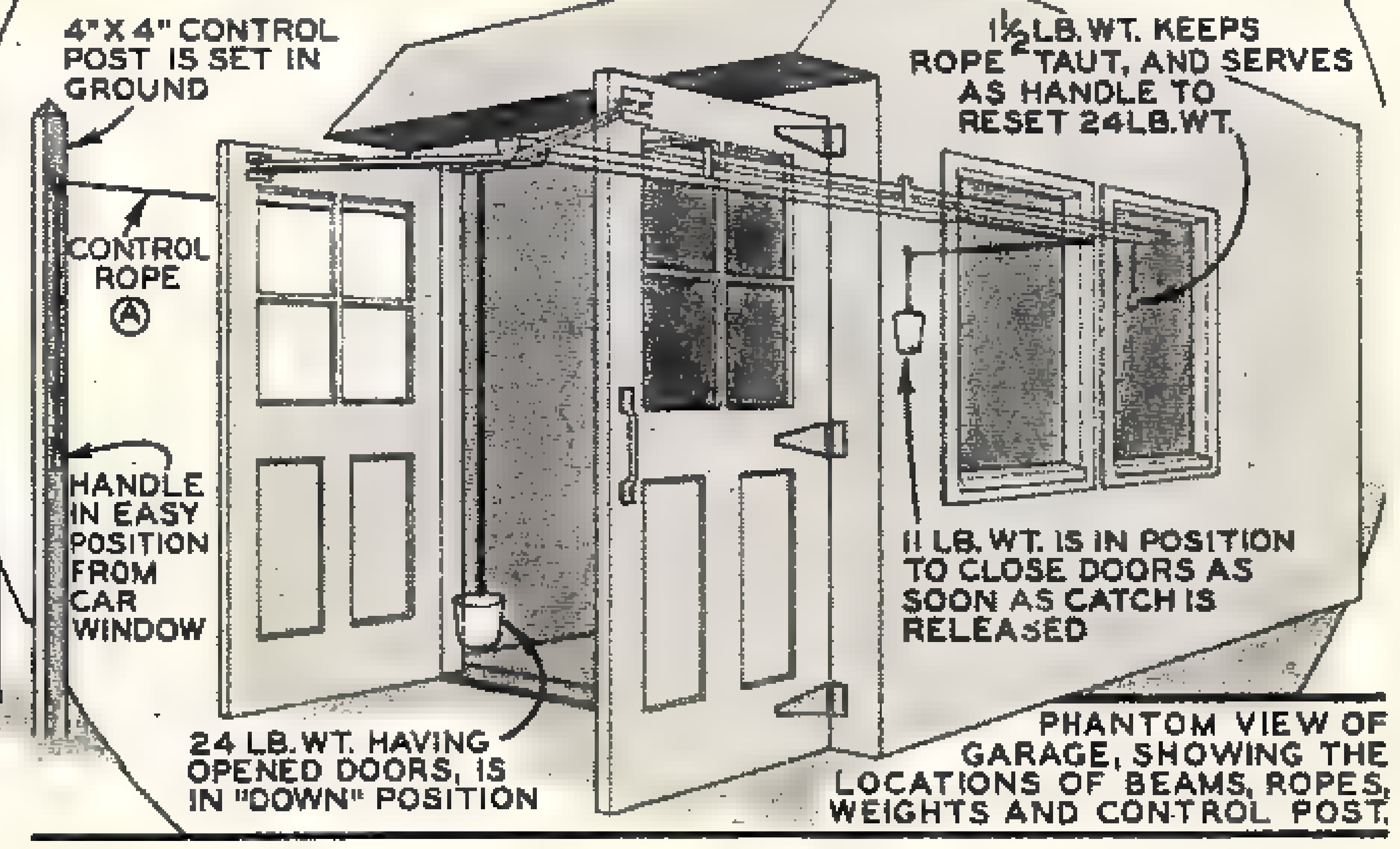
Details of automatic controls and weights are given above. Re-inforcing plates on moving wooden parts will prevent wear. As a safety measure, box-in weights.

After backing the car out of the garage, the driver merely has to reach out the window and pull the cord, thus closing the doors. A second pull on return opens them.


CONTROL ROPE, TO POST
2"X 4" 15" LONG
STRAP IRON ¼"X 1¼
3" INCH PULLEY
DETAIL "A"
HINGE
GARAGE DOOR
ROPE Ⓑ TO CONTROL ROPE, SEE DETAIL
ROPE Ⓒ TO 24 LB. WT. SEE DETAIL
PULLEY
1"X 1" HD. WOOD ARMS OF LENGTH TO HOLD DOORS AT CORRECT ANGLES WHEN MOVING BEAM IS IN "OPEN" POSITION
KNOT AND WASHER WILL NOT SLIP THRU SCREW-EYE
TO ALLOW RESETTING OF 24 LB. WT., ROPE MUST MOVE FREELY THRU SCREW-EYE IN THIS DIRECTION
PULLEY
ROPE Ⓓ
DIRECTION OF PULL, AS 24LB. WT. OPENS DOORS
WASHER
KNOT
SCREW-EYE
THIS WT. CLOSES DOORS
11 LBS
4"
4"
CATCH ENGAGES ROLLER BRACKET
THIS ROLLER BRACKET HOLDS DOORS OPEN WHEN ENGAGED BY CATCH
4"
1½LB. WT.
HINGES, SEE DETAIL
SPRING
SCREW-EYE
CEILING BEAM
12"
WIRE LINK
¼ x 1¼
¼ PLATE
3"
ROPE Ⓒ
ANGLE IRON
2"X 4" STA. BEAM
GARAGE DOOR
22"
SPACE TO PASS CATCH EASILY
42"
2"X 4" MOVING BEAM
DETAILS OF BEAMS IN CLOSED POSITION

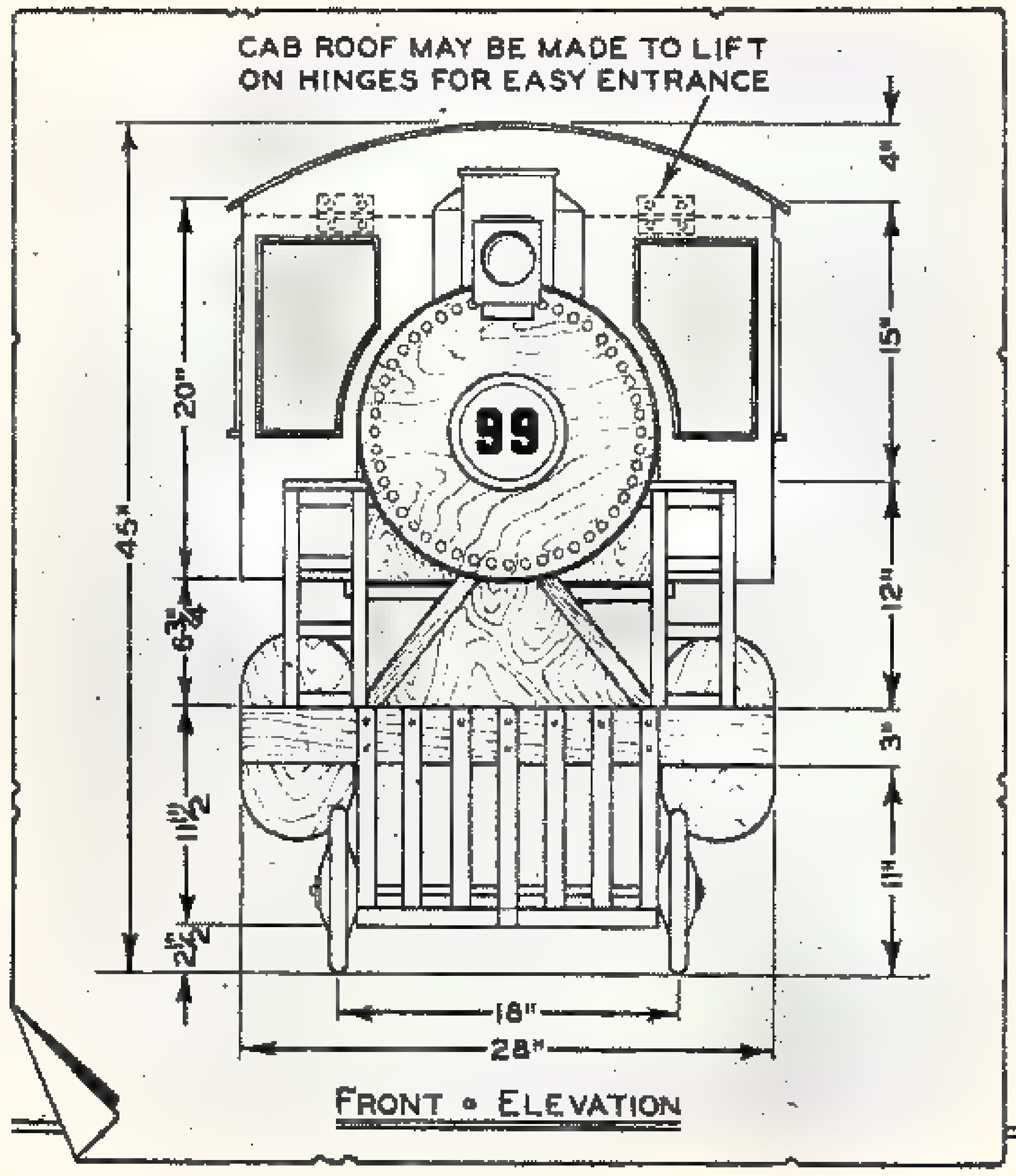

CEILING BEAM
SUSPENSION 2"X 4" IS CUT AWAY TO ALLOW THE MOVING BEAM ROLLERS TO PASS
STATIONARY BEAM
ROLLER BRACKET
MOVING BEAM

Suspension of the stationary beam is clearly illustrated. This beam runs the full length of the garage door to insure rigidity. The rollers should be kept well lubricated.


4"X 4" CONTROL POST IS SET IN GROUND
1½LB. WT. KEEPS ROPE TAUT, AND SERVES AS HANDLE TO RESET 24LB. WT.
CONTROL ROPE Ⓐ
HANDLE IN EASY POSITION FROM CAR WINDOW
11 LB. WT. IS IN POSITION TO CLOSE DOORS AS SOON AS CATCH IS RELEASED
24 LB. WT. HAVING OPENED DOORS, IS IN "DOWN" POSITION

PHANTOM VIEW OF GARAGE, SHOWING THE LOCATIONS OF BEAMS, ROPES, WEIGHTS AND CONTROL POST.

A Midget Foot-Powered Locomotive That Any Boy Can Build


CAB ROOF MAY BE MADE TO LIFT ON HINGES FOR EASY ENTRANCE
99
4"
15"
12"
3"
11"
20"
45"
6¾"
11½"
2½"
18"
28"
FRONT • ELEVATION

by MANLEY MILLS

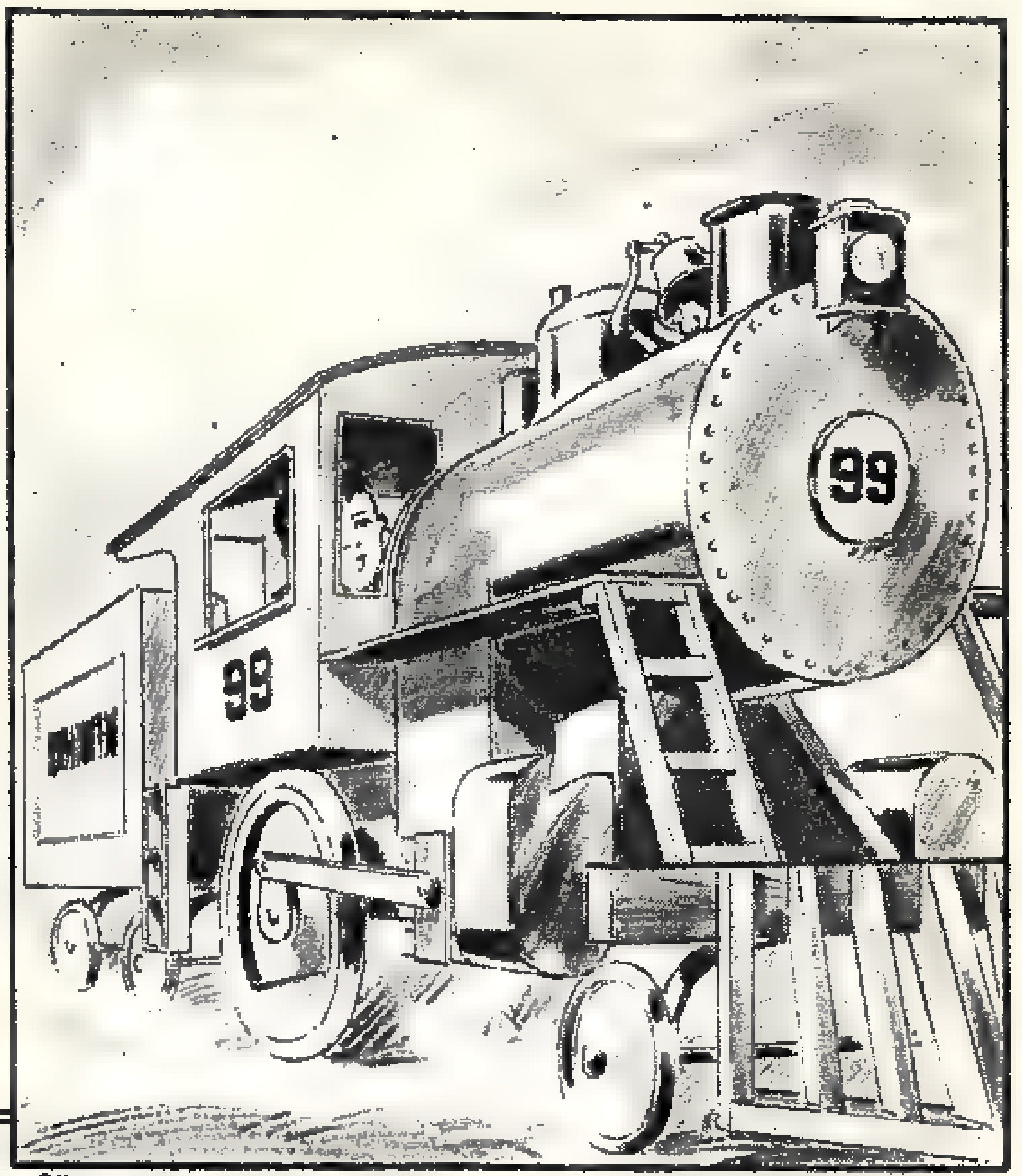
BUILT mostly from discarded materials that can be readily picked up about the workshop this novel foot-powered midget locomotive will make any youth the envy of his friends. Unlike the usual foot propelled locomotive, this one permits the engineer to ride in the cab instead of in the tender.

While it isn't necessary that the dimensions given here be followed out to the Nth degree, they should be followed as closely as possible in order that the locomotive will operate properly. In constructing the engine and tender start with the frame for the boiler. This is made from lengths of 3"x1" stock as is the rear cross-member and pilot beam. The pilot trucks are made from the front end of a coaster wagon chassis equipped with 9" wheels. The pilot guard is fashioned from either wood strips or strap iron, the latter being suggested.

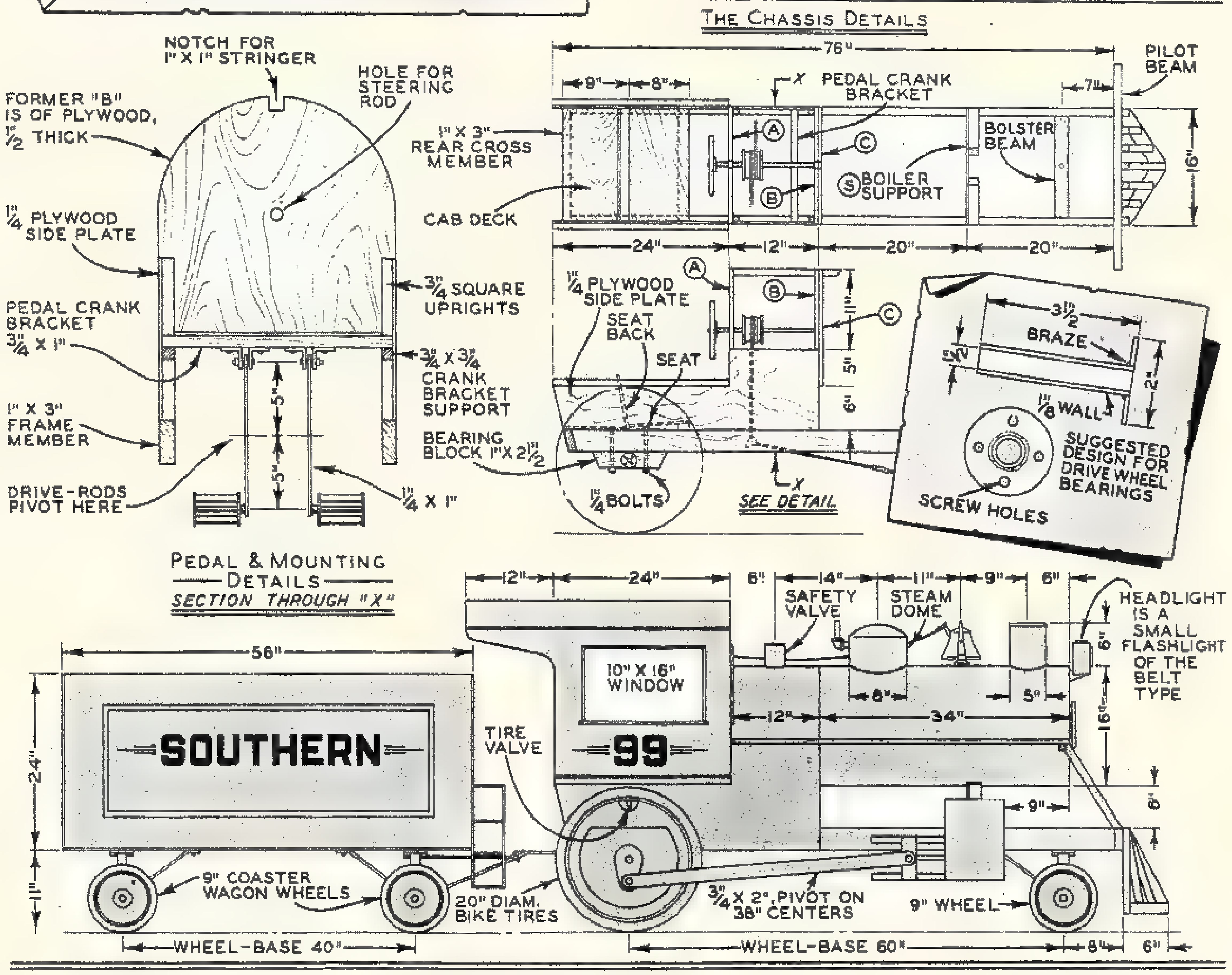
The boiler is of the thinnest gauge sheet metal obtainable and attached to a suitable wooden frame with small wood screws. The cab is made of plywood except for the roof which is of the same metal as the boiler. Sheet metal attached to a wooden supporting frame forms realistic cylinders for the driving rod mechanism. The drive rods being nothing more than lengths of stock measuring ¾x2x38" are extremely simple to make.

A pair of 20" bicycle rims are screwed in place over a disc having a diameter equal to the inside diameter of the rims. A notch is cut in the discs to allow for inflating the tires. The drive shafts are attached to the wheels

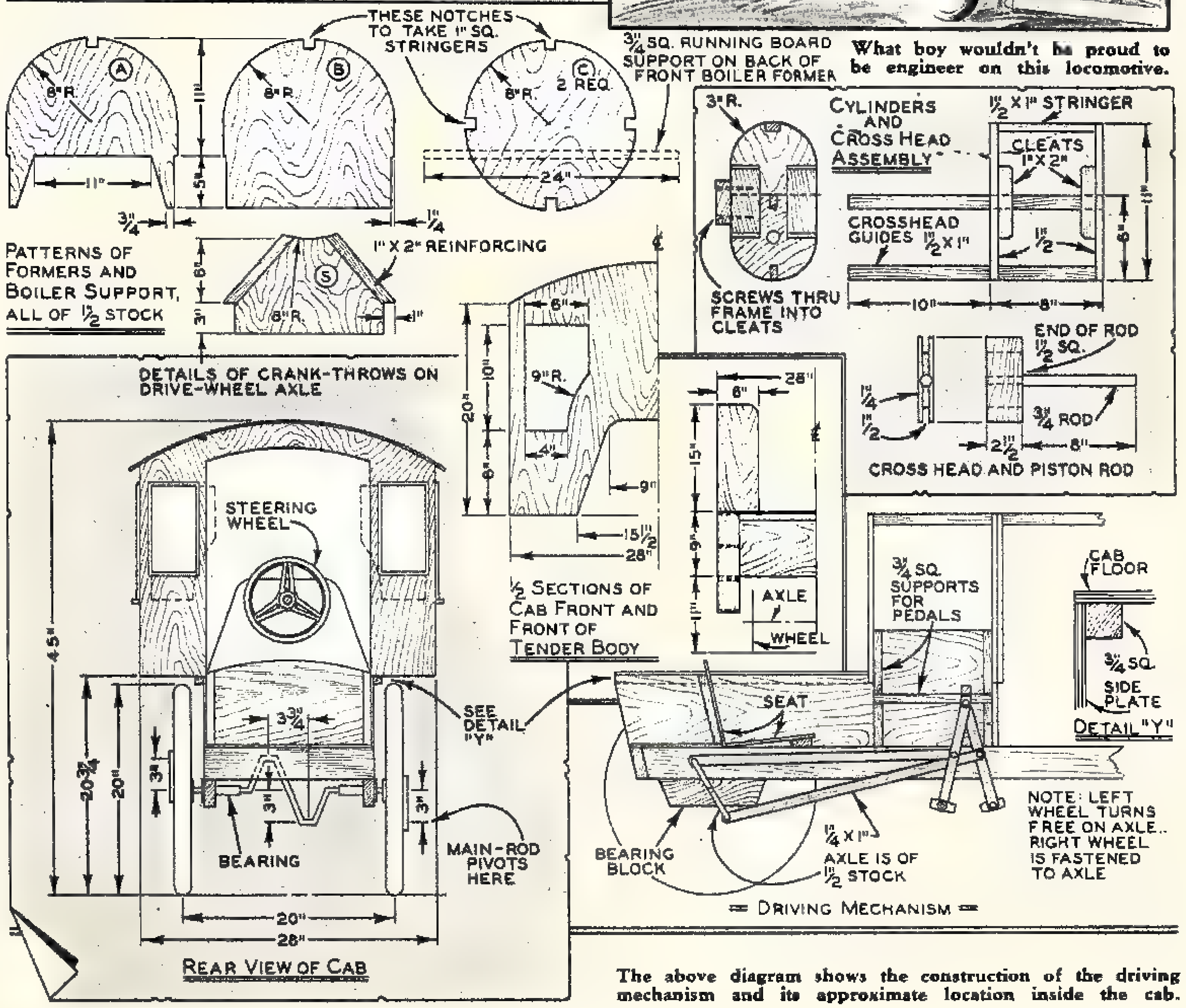
[*Continued on page* 120]



What boy wouldn't be proud to be engineer on this locomotive.

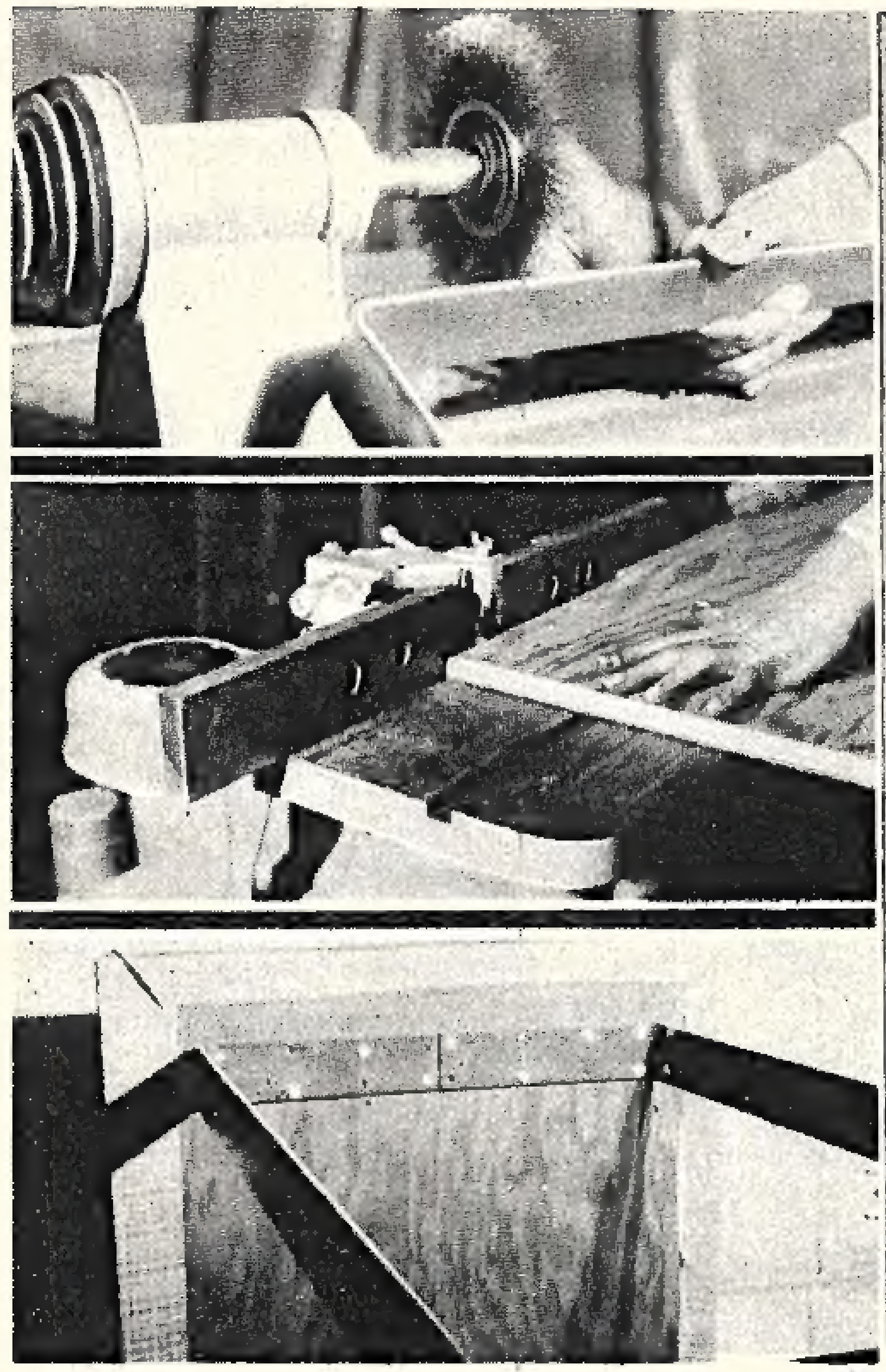

NOTCH FOR 1"X1" STRINGER
HOLE FOR STEERING ROD
FORMER "B" IS OF PLYWOOD, ½ THICK
¼ PLYWOOD SIDE PLATE
CAB DECK
PEDAL CRANK BRACKET ¾ X 1"
¾ SQUARE UPRIGHTS
¾ X ¾ CRANK BRACKET SUPPORT
1" X 3" FRAME MEMBER
BEARING BLOCK 1"X2½
DRIVE-RODS PIVOT HERE
¼ X 1"
5"
PEDAL & MOUNTING DETAILS
SECTION THROUGH "X"
THE CHASSIS DETAILS
76"
9"
8"
X
PEDAL CRANK BRACKET
7½"
PILOT BEAM
1" X 3" REAR CROSS MEMBER
BOLSTER BEAM
BOILER SUPPORT
16"
24"
12"
20"
20"
¼ PLYWOOD SIDE PLATE
SEAT BACK
SEAT
11"
5"
6"
¼ BOLTS
SEE DETAIL
X
3½
BRAZE
2"
⅛ WALL
SUGGESTED DESIGN FOR DRIVE WHEEL BEARINGS
SCREW HOLES
12"
24"
6"
14"
11"
9"
6"
SAFETY VALVE
STEAM DOME
HEADLIGHT IS A SMALL FLASHLIGHT OF THE BELT TYPE
56"
10" X 16" WINDOW
12"
8"
34"
5"
16"
SOUTHERN
99
TIRE VALVE
24"
9"
6"
11"
9" COASTER WAGON WHEELS
20" DIAM. BIKE TIRES
¾ X 2". PIVOT ON 38" CENTERS
9" WHEEL
WHEEL-BASE 40"
WHEEL-BASE 60"
8¼"
6"

The above pictorial diagrams show the simplicity of the toy locomotive. While it is not necessary to follow the exact dimensions given here adhere to them as closely as possible. Parts from broken toy autos and wagons will aid in construction.

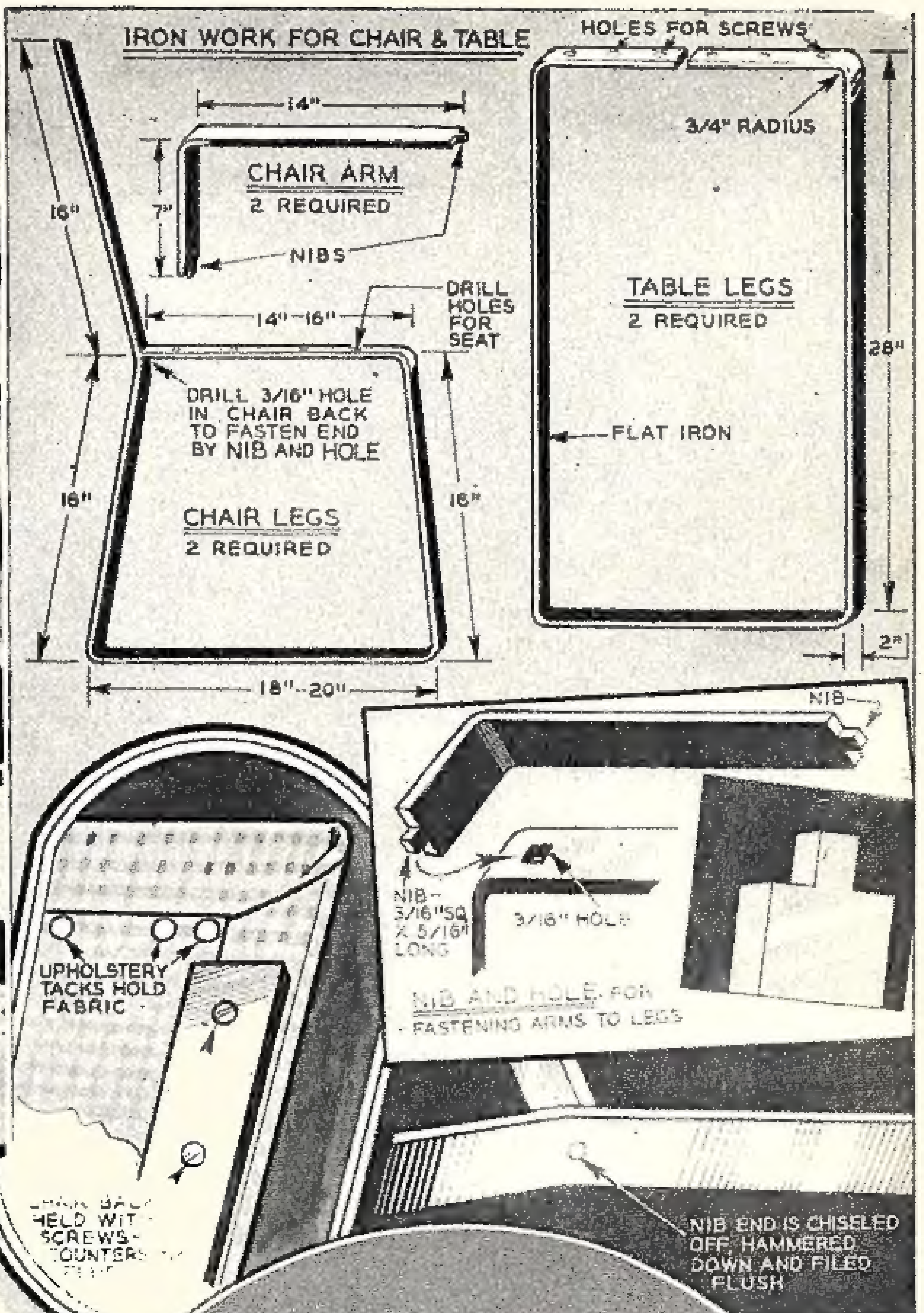

THESE NOTCHES TO TAKE 1" SQ. STRINGERS
A
B
C
8"R.
8"R.
8"R.
2 REQ.
11"
11"
5½"
24"
¾
¼
1" X 2" REINFORCING
PATTERNS OF FORMERS AND BOILER SUPPORT, ALL OF ½ STOCK
S
6"
3"
8"R.
1"
¾ SQ. RUNNING BOARD SUPPORT ON BACK OF FRONT BOILER FORMER
3"R.
CYLINDERS AND CROSS HEAD ASSEMBLY
½ X 1" STRINGER
CLEATS 1"X2"
CROSSHEAD GUIDES ½ X 1"
SCREWS THRU FRAME INTO CLEATS
10"
8"
11"
½
END OF ROD ½ SQ.
¼
½
¾ ROD
2½
8"
CROSS HEAD AND PISTON ROD
DETAILS OF CRANK-THROWS ON DRIVE-WHEEL AXLE
6"
9"R.
4"
20"
10"
8"
9"
15½"
28"
½ SECTIONS OF CAB FRONT AND FRONT OF TENDER BODY
28"
6"
15"
9"
11"
AXLE
WHEEL
STEERING WHEEL
45"
20¾
20"
3¾
3"
3"
3"
BEARING
SEE DETAIL "Y"
MAIN-ROD PIVOTS HERE
20"
28"
REAR VIEW OF CAB
¾ SQ. SUPPORTS FOR PEDALS
SEAT
CAB FLOOR
¾ SQ. SIDE PLATE
DETAIL "Y"
BEARING BLOCK
¼ X 1"
AXLE IS OF ½ STOCK
NOTE: LEFT WHEEL TURNS FREE ON AXLE.. RIGHT WHEEL IS FASTENED TO AXLE
DRIVING MECHANISM

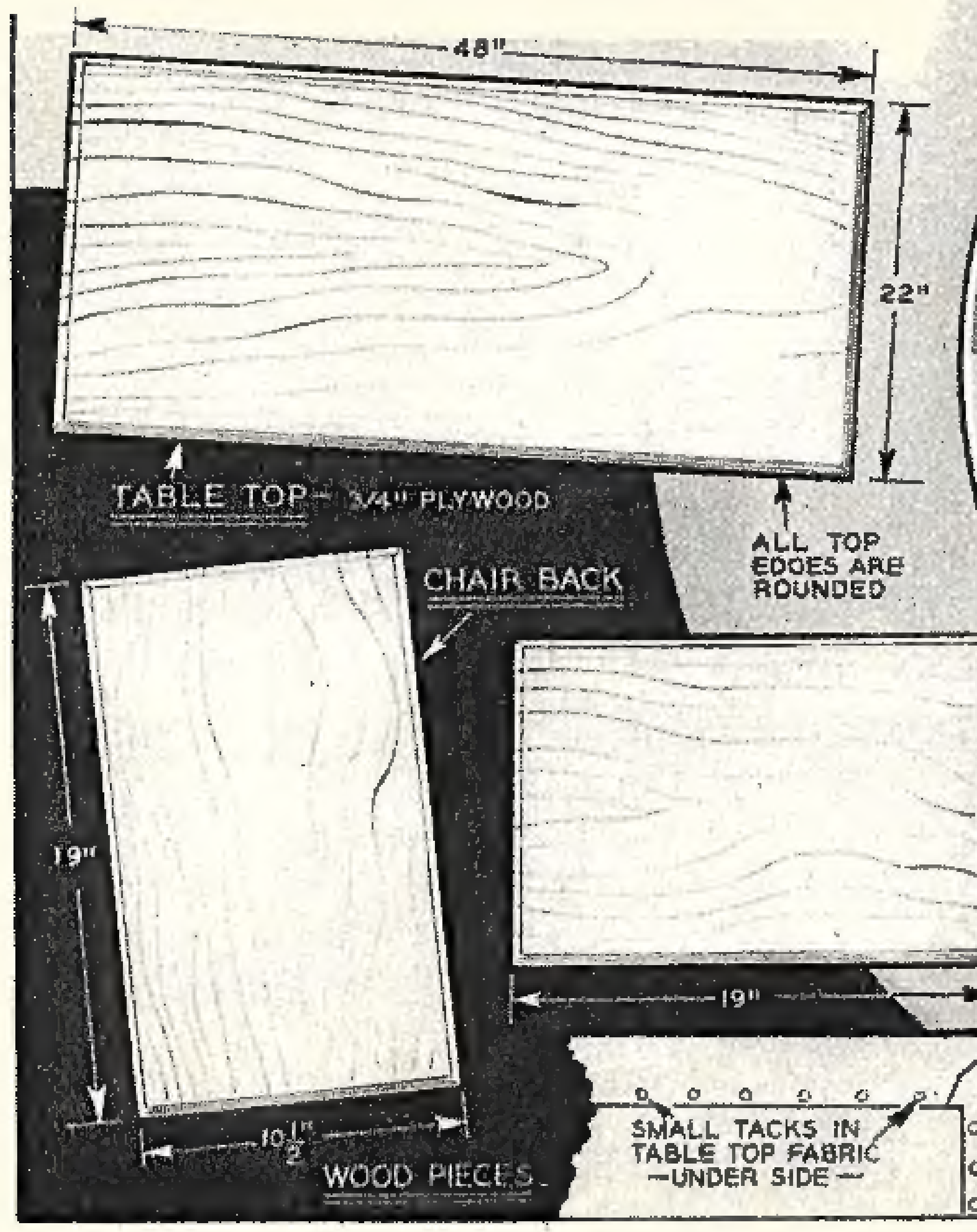
The above diagram shows the construction of the driving mechanism and its approximate location inside the cab.

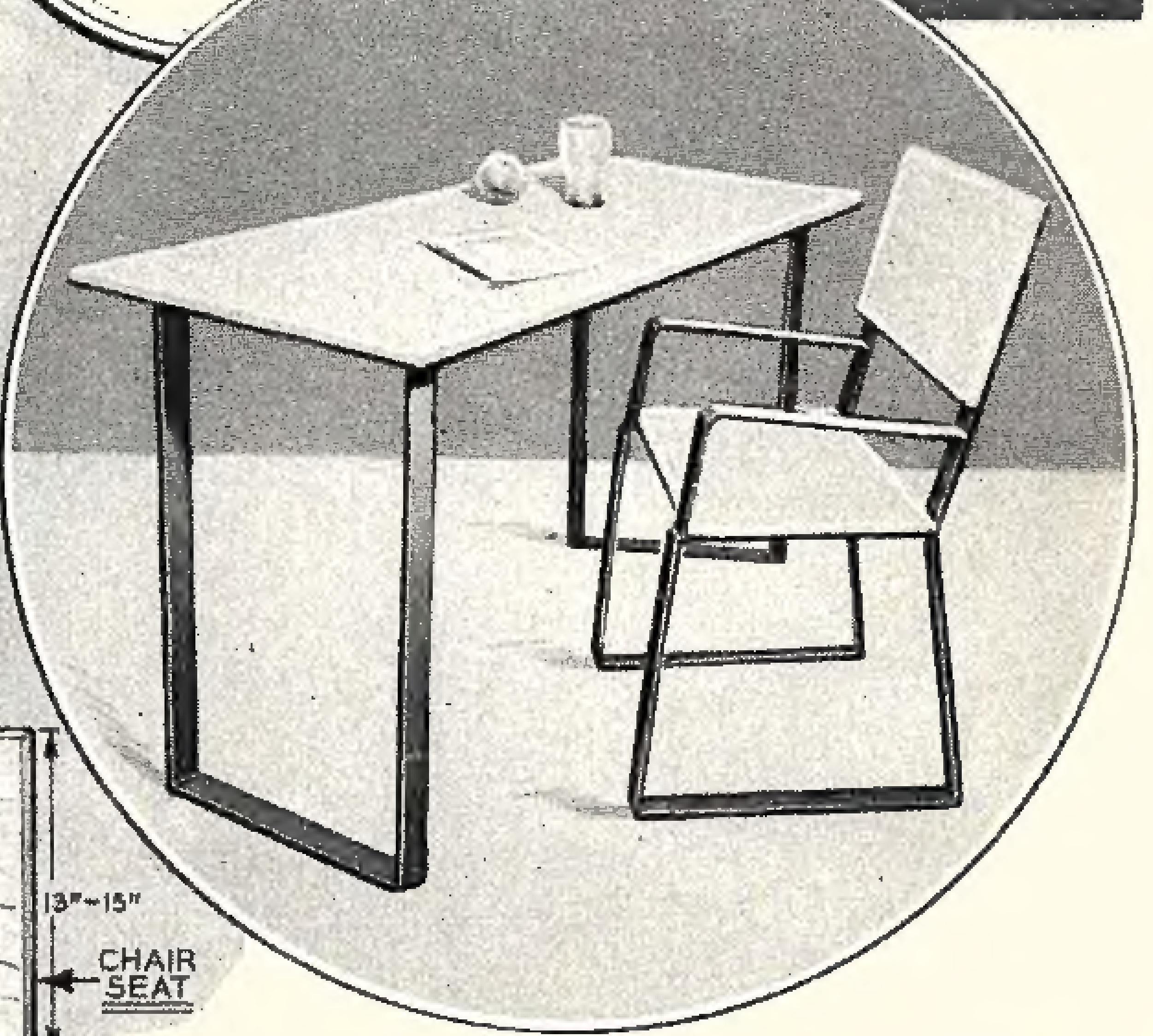
Practical MODERN FURNITURE FOR THE WORKSHOP FAN



Modern furniture is easy to make. The upper photo shows how a scratch wheel may be used to give the metal a bright finish after which it is lacquered. Center photo is shown the table top being squared up on the shaper with the leg installation clearly defined in the lower picture.


IRON WORK FOR CHAIR & TABLE
HOLES FOR SCREWS
14"
CHAIR ARM
2 REQUIRED
7"
16"
NIBS
3/4" RADIUS
DRILL HOLES FOR SEAT
14"-16"
TABLE LEGS
2 REQUIRED
28"
DRILL 3/16" HOLE IN CHAIR BACK TO FASTEN END BY NIB AND HOLE
16"
FLAT IRON
CHAIR LEGS
2 REQUIRED
16"
2"
18"-20"
NIB
NIB- 3/16" SQ. X 5/16" LONG
3/16" HOLE
NIB AND HOLE FOR FASTENING ARMS TO LEGS
UPHOLSTERY TACKS HOLD FABRIC
HELD WITH SCREWS-
NIB END IS CHISELED OFF, HAMMERED DOWN AND FILED FLUSH


48"
22"
TABLE TOP— 3/4" PLYWOOD
ALL TOP EDGES ARE ROUNDED
CHAIR BACK
19"
13"-15"
CHAIR SEAT
19"
10½"
WOOD PIECES
SMALL TACKS IN TABLE TOP FABRIC —UNDER SIDE—



Not only is this modern table and chair durable, but very attractive as well. Constructed of strap iron and plywood the furniture can be worked into the color scheme of any home. Forming of the metal parts can be done at home by following the diagrams given here. The height may be altered to meet the particular needs although care should be taken to keep one leg or chair arm from being higher than the other. The furniture is covered with plaid fabric.

For the home shopman who makes his own, these interesting pieces of ultra-modern furniture are certain to win favor.

MANY pieces of the wood and metal modernistic styled furniture that is now so popular can be easily duplicated in your home workshop. If you are the owner of a few woodworking tools and have access to a strong vise and forge you are ready to start construction. If you don't have the latter equipment any blacksmith shop can quickly form the metal for you at a nominal charge.

The modernistic chair and table pictured on the opposite page are extremely simple to make and when completed prove unusually attractive. About 32 feet of 3/16"x2" strap iron, three pieces of ¾" plywood, one piece 48"x22" for the table top, another 19"x10½" for the chair back and a third 19"x15" for the chair seat are the only materials required.

The strap iron for the table legs is bent according to the dimensions given in the diagrams. Holes drilled and countersunk in the metal allow the table and chair legs to be attached to the plywood. In making these metal pieces make certain that they match so that the furniture sets level. The height of the table may be increased to meet your particular needs if desired.

The chair may be constructed with or without arms. If arms are desired cut nibs in the strap iron so that the formed metal can be rigidly mounted to the chair legs. To do this drill holes in the leg and back supports, insert the arm nibs then hammer them flat as you would rivets.

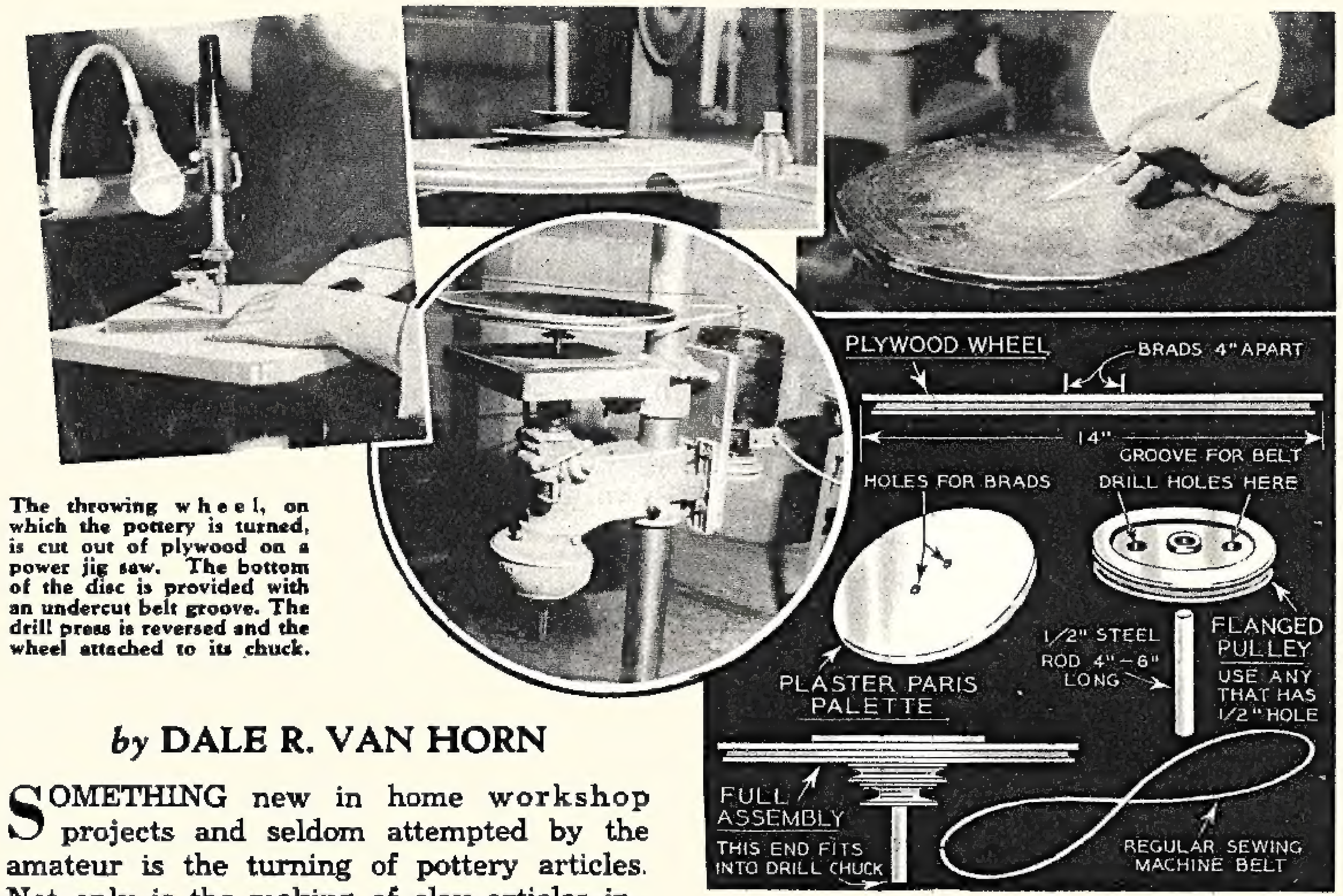
The table top, chair seat and back are finished by covering them with a water-proof plaid material similar to the coverings used on cardtables. Cotton wadding under the material will greatly improve the appearance of the project. After removing all rust particles from the metal it can be enameled in a color that will contrast with the plaid material. Probably the most attractive combination is a red, orange, green or blue plaid with the metal parts finished in silver bronze although any combination may be used.

Twin beds in the modern trend of design supply another idea for the ambitious shopman. The beds, which are ideal for a small guest room, consist of four units; head, foot and two side rails. The head and foot pieces are made of ½" plywood panels with a ¾"x 2" trim around the edge and mitered at the corners. The trim is attached with finishing nails and casein glue after which casters are mounted.

The bed rails are of stock ¾"x6"x6'x2" with bedhooks attached to each end. These being obtainable at any hardware store. Slots cut in the head and foot pieces allow for

TURNING CLAY PROJECTS on A POTTERS' WHEEL

Attractive vases, crocks and jars of baked clay can be produced in the home workshop. An ordinary drill press forms the basic throwing wheel equipment.



The throwing wheel, on which the pottery is turned, is cut out of plywood on a power jig saw. The bottom of the disc is provided with an undercut belt groove. The drill press is reversed and the wheel attached to its chuck.

A steel flanged pulley screwed to the bottom of the plywood disc completes the throwing wheel assembly. A short length of ½-inch steel shafting connects to the flanged wheel and the drill press chuck as described above. Plaster of Paris palette is attached to the top of the wheel with small brads. A regular sewing machine belt transmits the power from motor to wheel.

by DALE R. VAN HORN

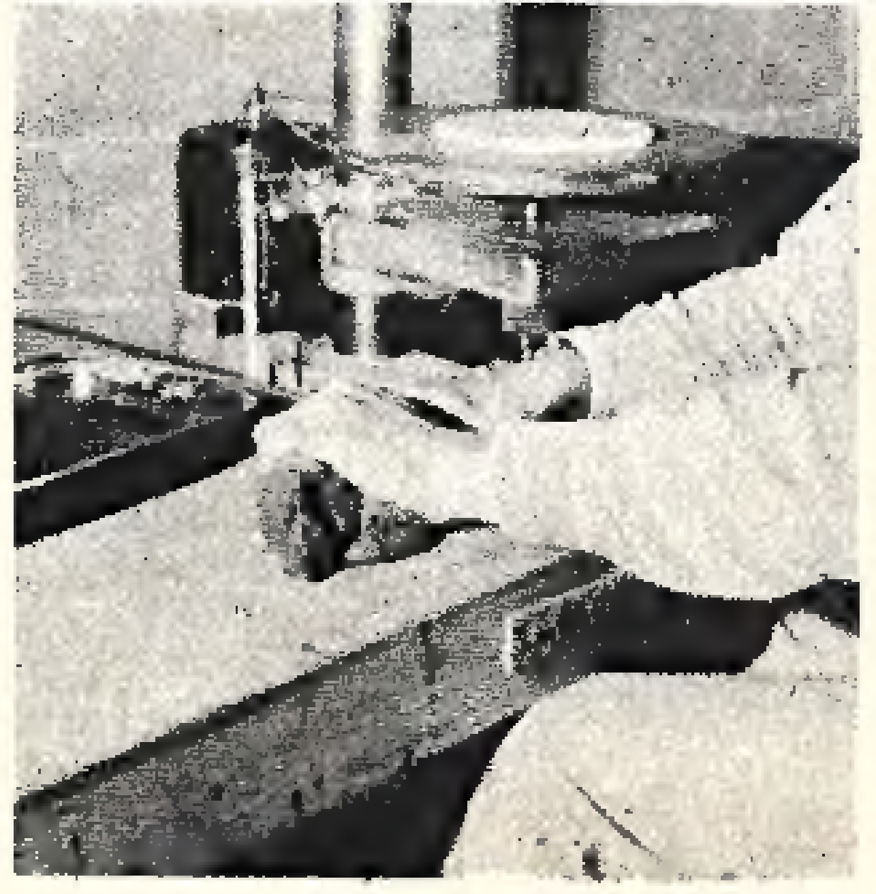
SOMETHING new in home workshop projects and seldom attempted by the amateur is the turning of pottery articles. Not only is the making of clay articles interesting, but simple if your shop includes a floor type drill press.

The extreme rigidity of the modern drill press makes its adaption to turning a potters' wheel ideal. The first step is to reverse the chuck and motor position with the chuck under the table and centered with the center hole. To bring the end of the motor shaft in line with the wheel groove it was necessary to cut out a board for the purpose, drill the necessary holes, then bolt it to the motor support as a photo shows.

The largest wheel possible to use with this drill press is one about 14 inches in diameter, so this was cut from 5-ply wood with the jig saw. To utilize as much of this large diameter as possible for speed reduction, yet get the belt just under the edge where occasionally mud and water would not work under it, a groove was cut with one of the shaper knives to the shape shown. An ordinary sewing machine belt was used.

Two turns of friction tape wrapped about the motor shaft itself and the belt run directly on the shaft will provide an ideal speed of about 114 R. P. M. A belt tightened with an idler pulley to be operated with the foot will provide graduated speeds. This can be clamped to the drill press table and removed when wanted. Of course, with a little practice you will be able to turn out nice pottery pieces with the constant speed wheel.

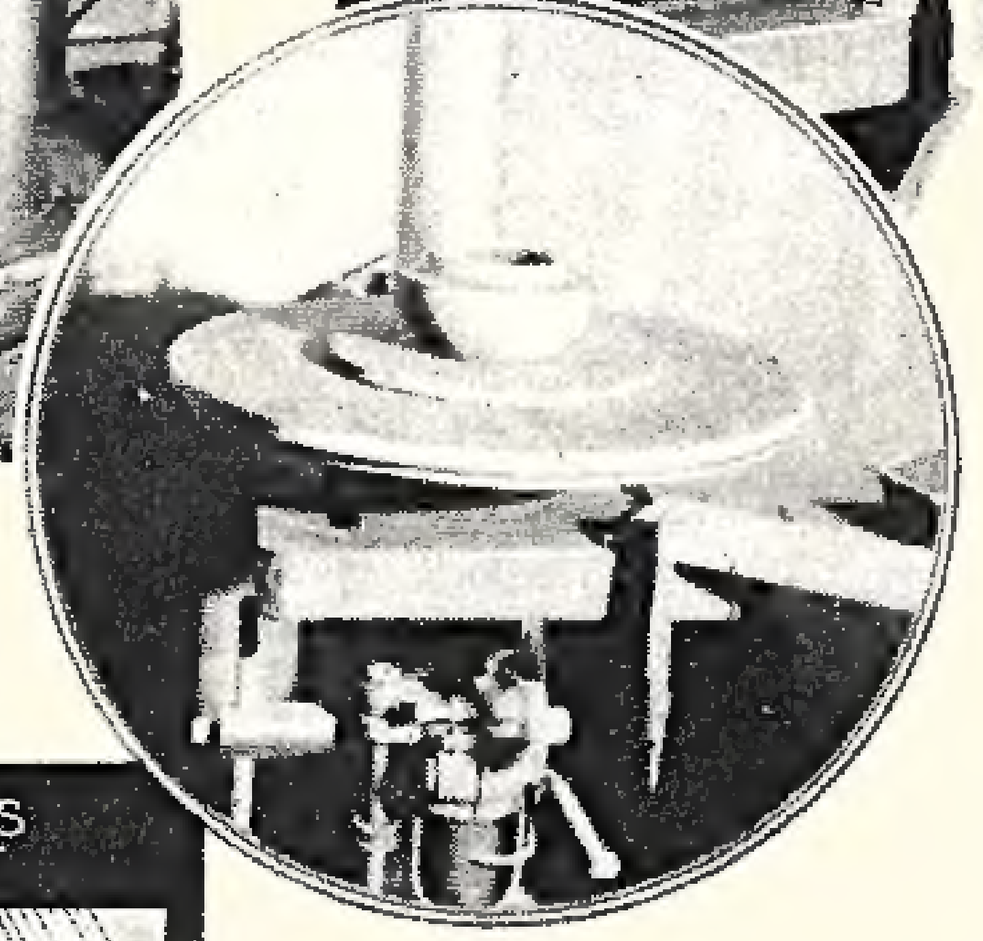
Floor flanges are not accurately drilled, so a better line up results if any ordinary grooved pulley fitting a half inch shaft is drilled for 2, 3 or 4 screws midway between rim and center and this fastened to the exact center of the plywood wheel with wood screws. The 4 or 6-inch half inch shaft is then fastened in the pulley wheel with the set screw provided, and the other end of the half inch shaft set tightly in the drill chuck.

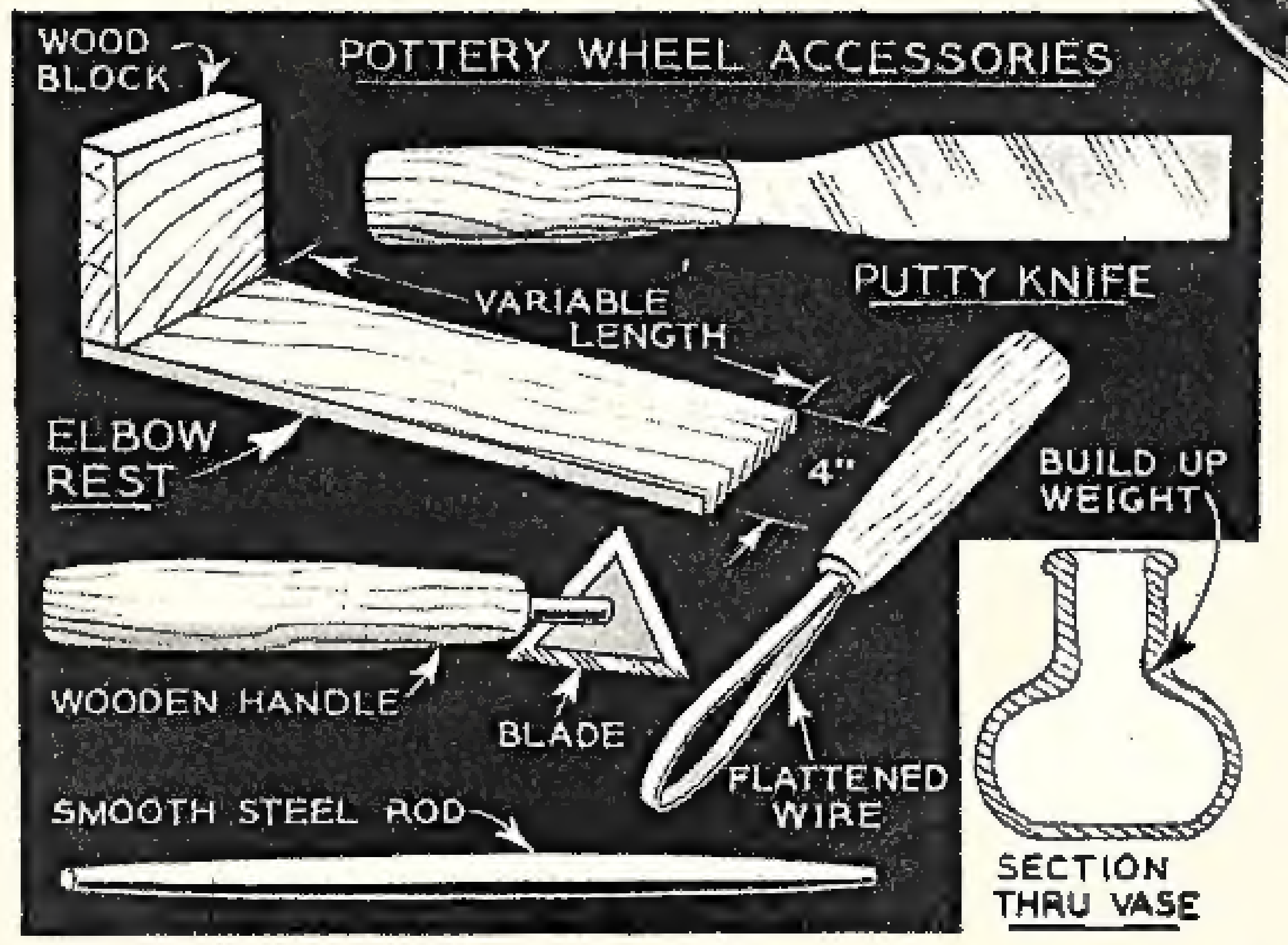


Suitable clay for pottery work may be secured from a local brickyard for a few cents. The clay is handled in the same manner as dough after which it is rolled out, as illustrated above, into long rolls using a flat board for the working tool. In making the coils it is advisable not to have the clay too moist, otherwise it may stick to the forming tools.

Above is pictured one of the completed pieces of pottery turned on the home throwing wheel with the various stages in its construction shown below. Note that the clay rolls are placed around the palette gradually and more added as the bottom is completed. The neck of vase is added last and this turned to shape, carefully.

Start the project by applying a pliable lump of clay to the plaster palette then with the throwing wheel turning at a speed of about R. P. M. spread out the lump with a broad putty knife as shown here.





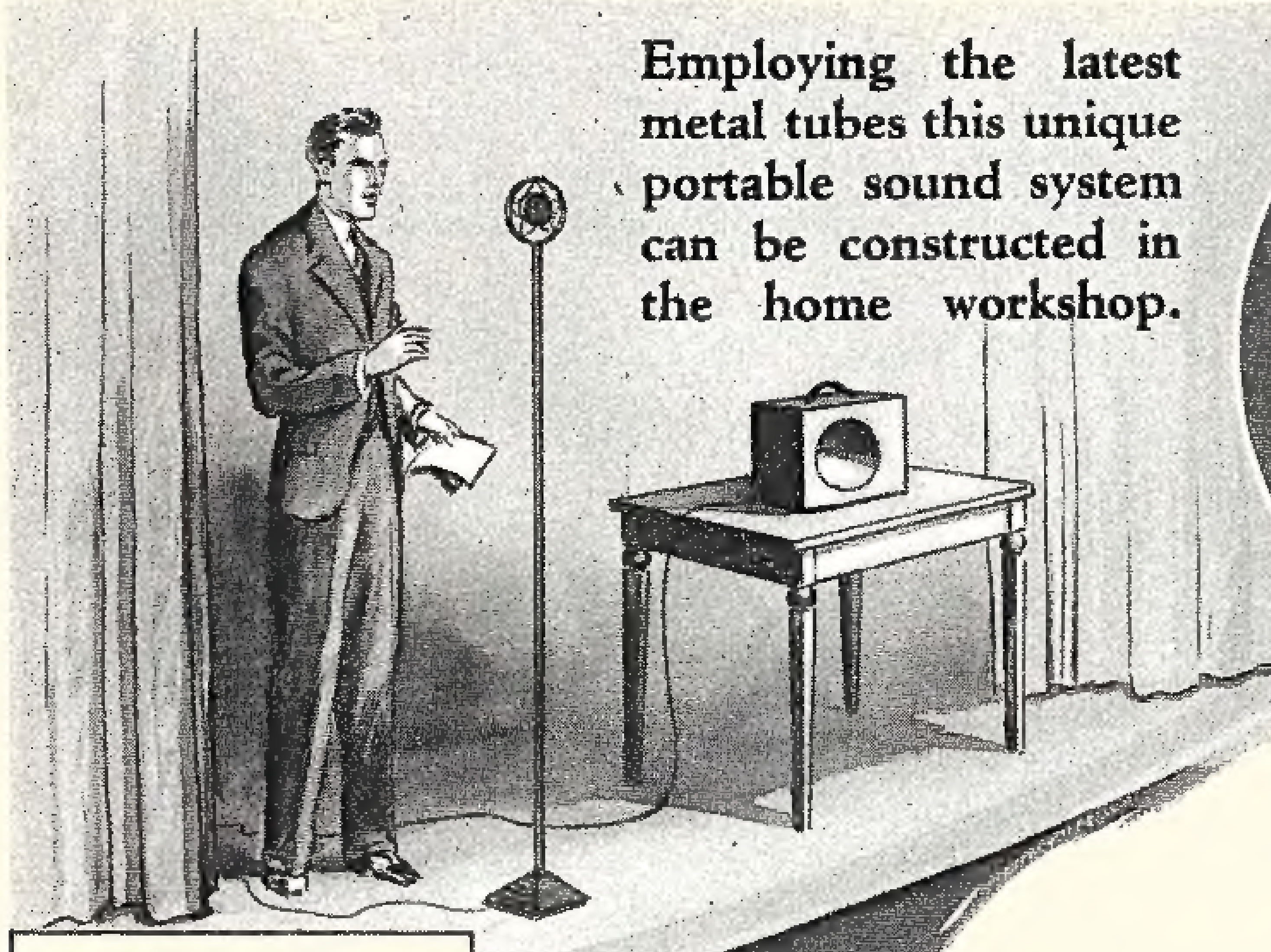
Only simple homemade tools are required for turning pottery projects. These consist of a simple elbow rest, a flexible putty knife, steel rod and clock spring mounted on a handle.

The wood wheel should be given a double coat of clear lacquer or varnish and special attention given the rim, both top and bottom, to render water proof.

Two or more palettes should be made from plaster of Paris. Mix the plaster and pour it out on a flat surface to harden. Then drill two holes to fit the brads in the wood wheel, drop in place and with a file tang held vertically and the wheel in motion, cut through the surplus plaster to leave a round palette upon which pottery is to be made.

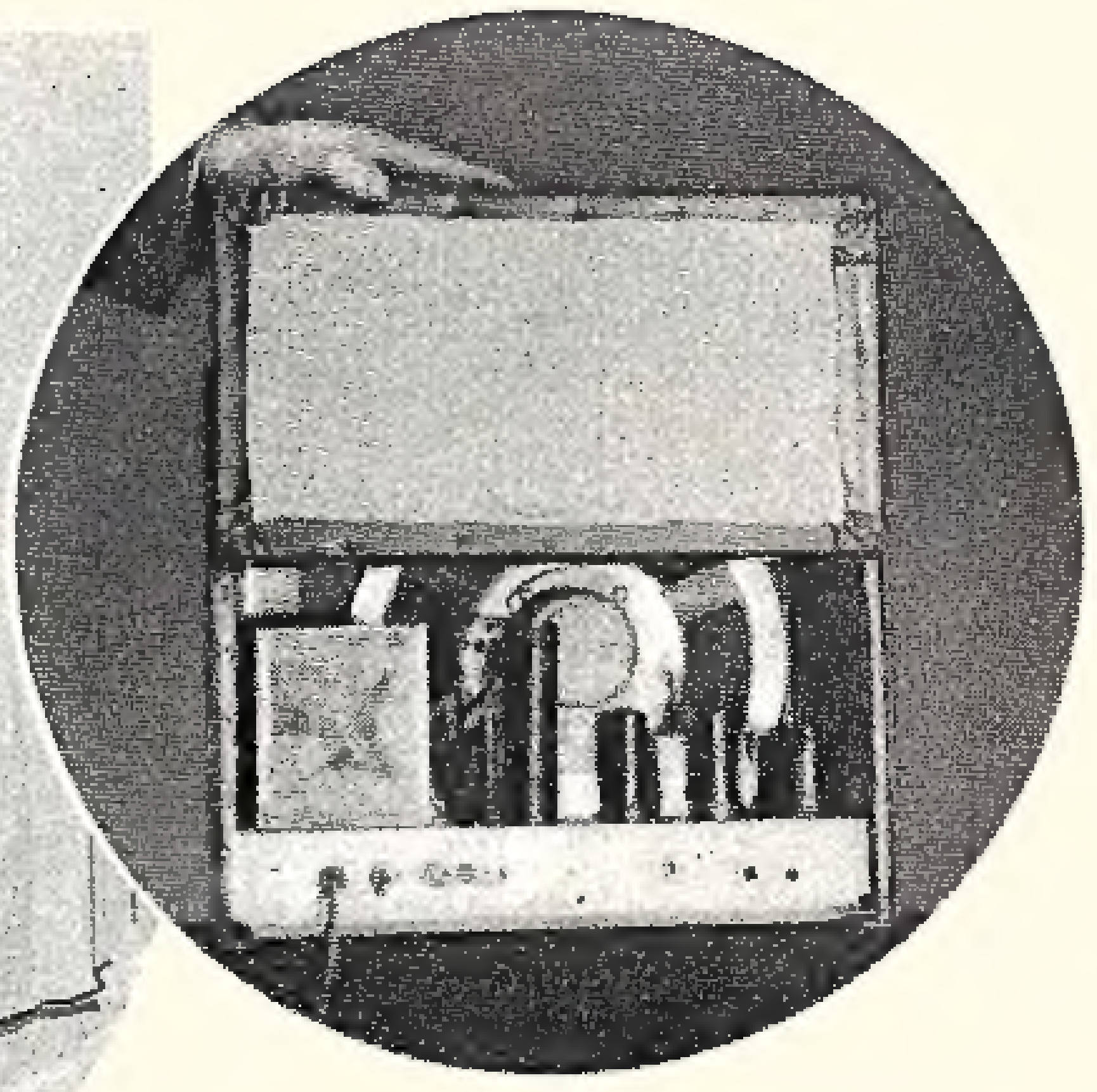
[*Continued on page* 128]

"MM METAL TUBE MASTER"— A PORTABLE SOUND SYSTEM



Employing the latest metal tubes this unique portable sound system can be constructed in the home workshop.

Small enough to carry around yet extremely powerful, MM Master is an ideal sound system.



Above is shown a rear view of the MM Master with the lid of the cabinet raised. The speaker attaches to the chassis.

by J. R. MACK

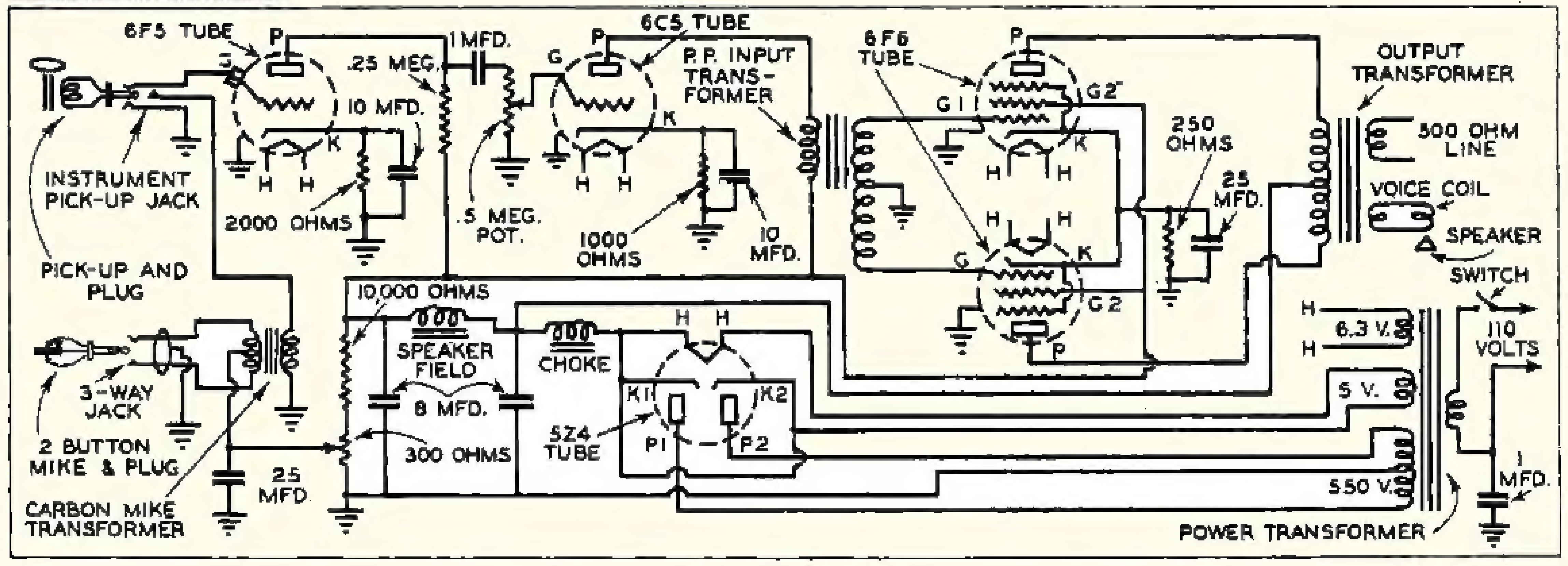
Appearing more like a traveling bag than an amplifier container this case made of leatherette and wood nicely solves the carrying problem.

NEARLY everyone at some time has wished for his own portable public address system either for supplying music for a party or in making announcements at outdoor gatherings. Practical portable sound systems are usually expensive, therefore placing them beyond the reach of the average income. Realizing this fact an amplifier was decided upon which could be constructed by anyone the least bit familiar with radio. Through the use of modern metal tubes and a high-gain circuit the completed public address system offered all of the advantages of the expensive equipment yet it cost less than $25 to build.

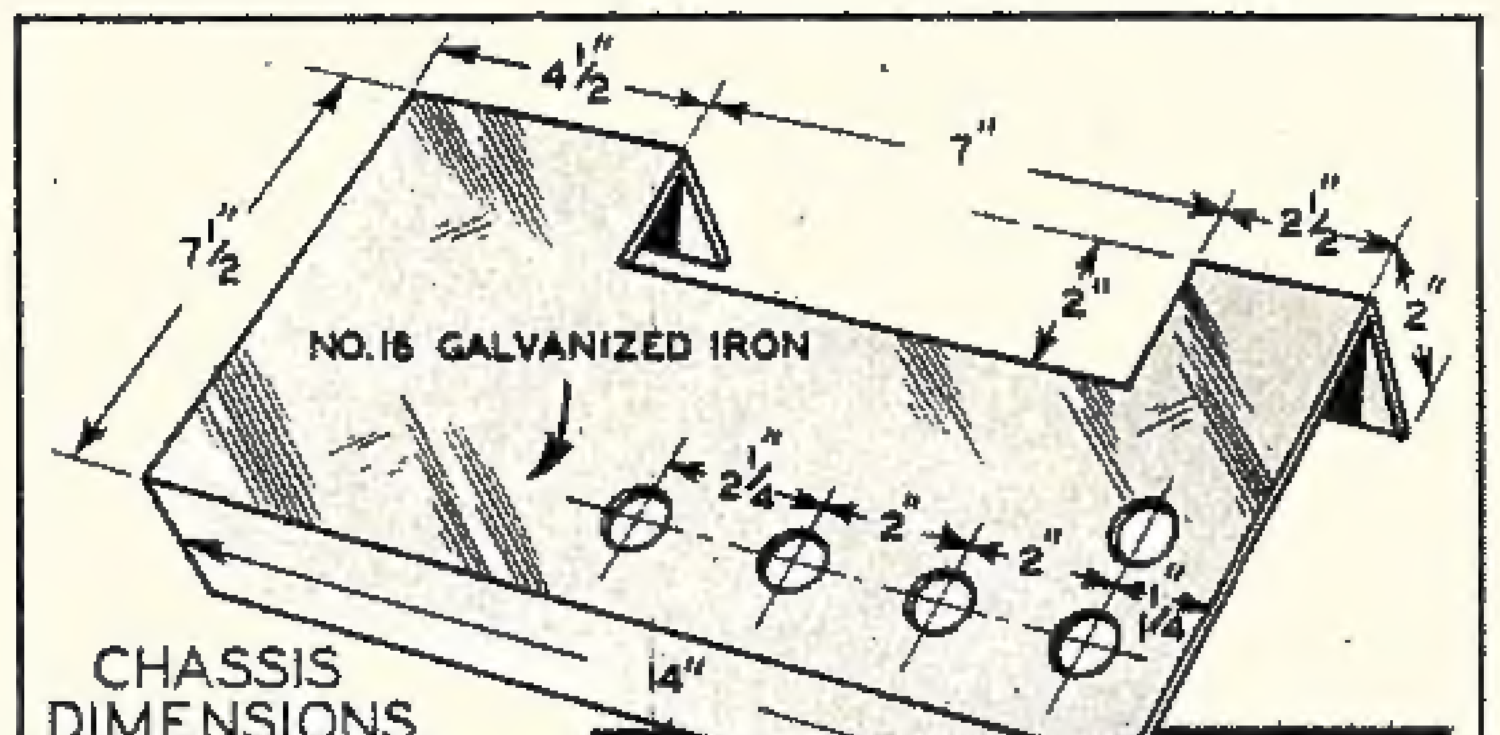
Parts for building the amplifier may be purchased from any mail order or local radio supply house including the metal chassis although it is quite simple to make this yourself from No. 16 galvanized sheet iron. The panel is laid out according to the dimensions given on the diagram and then bent to shape. Any tinsmith will do this work for you for a small charge.

The sockets for the metal tubes are installed first, after which the power transformer, A. F. transformers and other mountable items are fastened in their respective positions. The speaker is a 12-inch dynamic type mounted to the front of the chassis with machine screws. The field coil winding of the speaker serves as the filter choke thus saving valuable chassis space. A type 5Z4 tube serves as the rectifier with two 8-mfd. electrolytic condensers providing the necessary filter capacity.

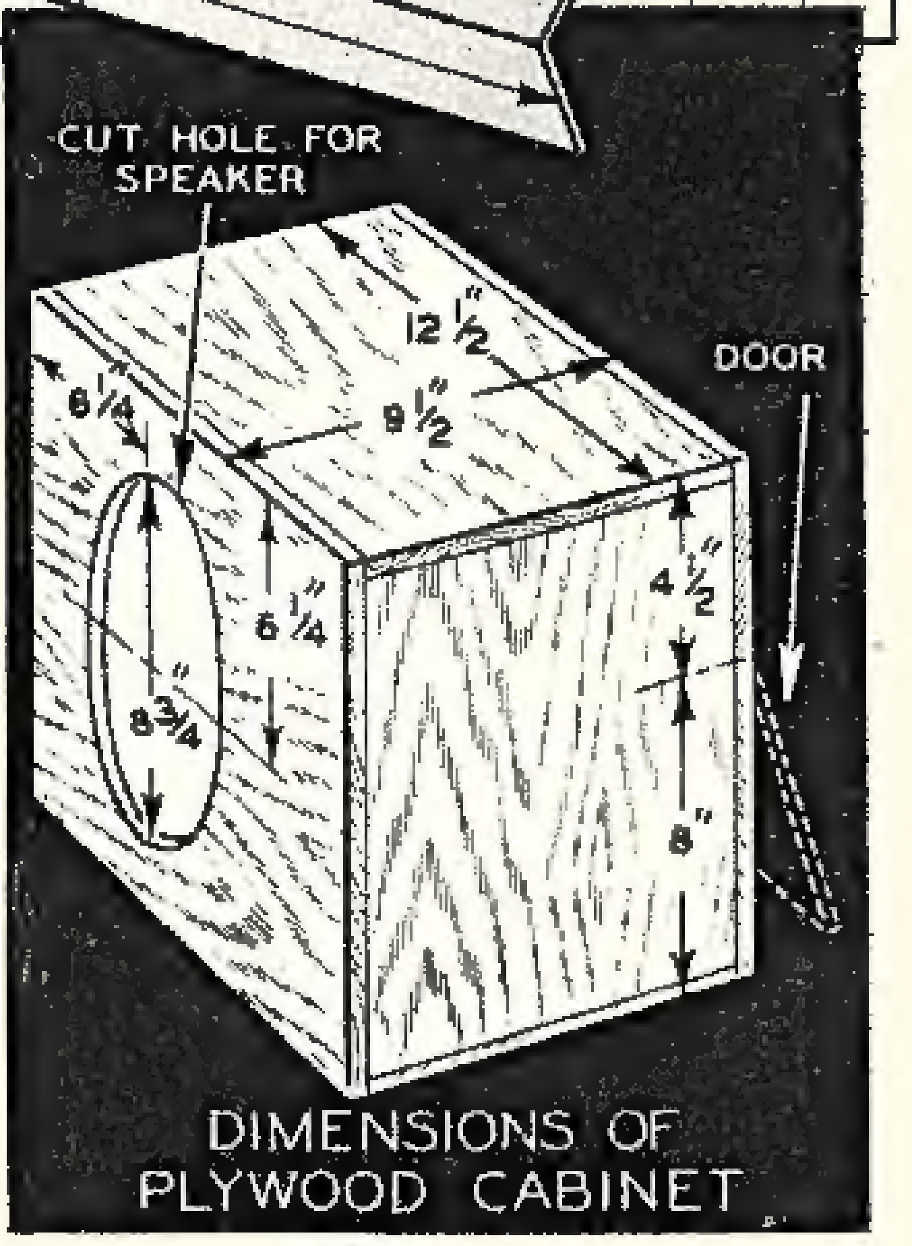
[*Continued on page* 124]

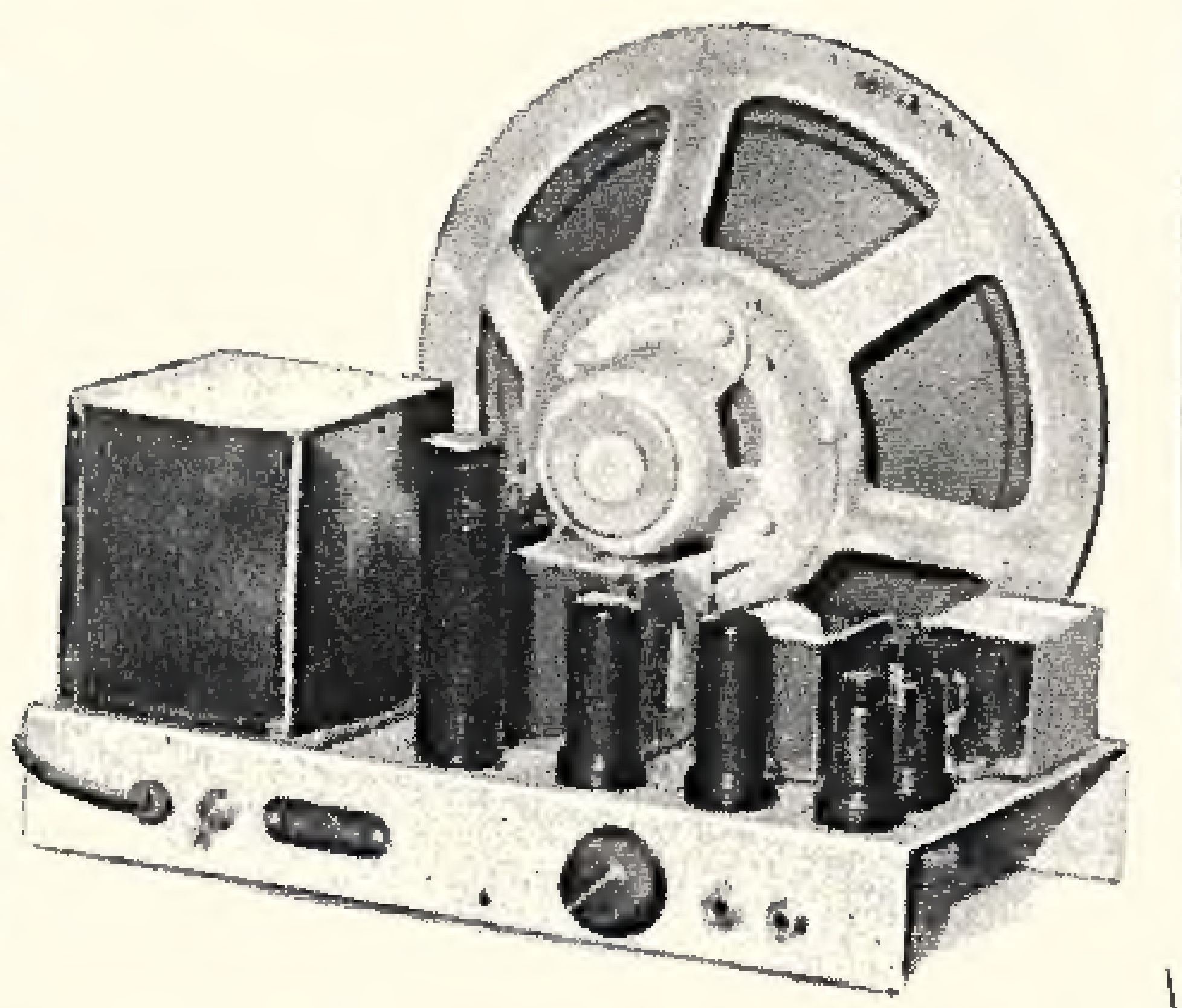

6F5 TUBE
P
G
K
H H
.25 MEG.
10 MFD.
1 MFD.
INSTRUMENT PICK-UP JACK
2000 OHMS
PICK-UP AND PLUG
6C5 TUBE
P
G
K
H H
.5 MEG. POT.
1000 OHMS
10 MFD.
P.P. INPUT TRANS-FORMER
6F6 TUBE
P
G1
G2
K
H H
H H
G
K
G2
P
250 OHMS
25 MFD.
OUTPUT TRANSFORMER
500 OHM LINE
VOICE COIL
SPEAKER
SWITCH
H
6.3 V.
H
110 VOLTS
5 V.
550 V.
1 MFD.
POWER TRANSFORMER
3-WAY JACK
2 BUTTON MIKE & PLUG
CARBON MIKE TRANSFORMER
25 MFD.
10,000 OHMS
SPEAKER FIELD
8 MFD.
300 OHMS
CHOKE
H H
K1
K2
5Z4 TUBE
P1
P2

The experienced radio builder will find this schematic diagram helpful in wiring up the amplifier. Wherever possible connect leads directly to the ground so as to eliminate all unnecessary wiring. Pick-up and microphone jacks should be insulated from panel. Since all metal tube sockets have the same number of prongs care should be exercised so that connections are made correctly. Although indicated at 550 volts, power transformer can have plate voltage output of slightly more or less than this.

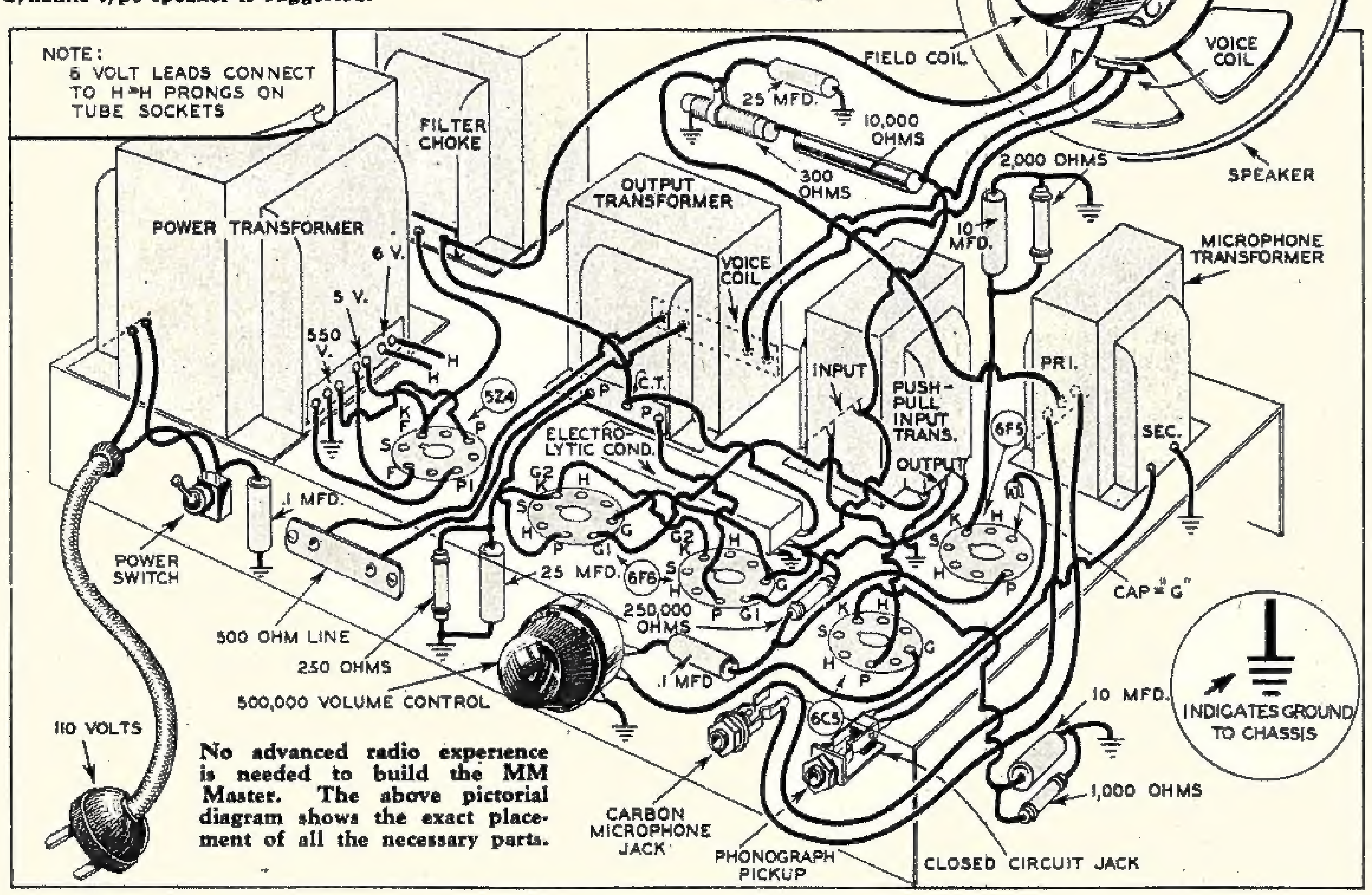

4½"
7"
2½"
2"
7½"
2"
NO.16 GALVANIZED IRON
2¼"
2"
2"
1¼"
14"
CHASSIS DIMENSIONS

The chassis is cut as shown from No. 16 galvanized iron. The cabinet is of wood covered with leatherette material.

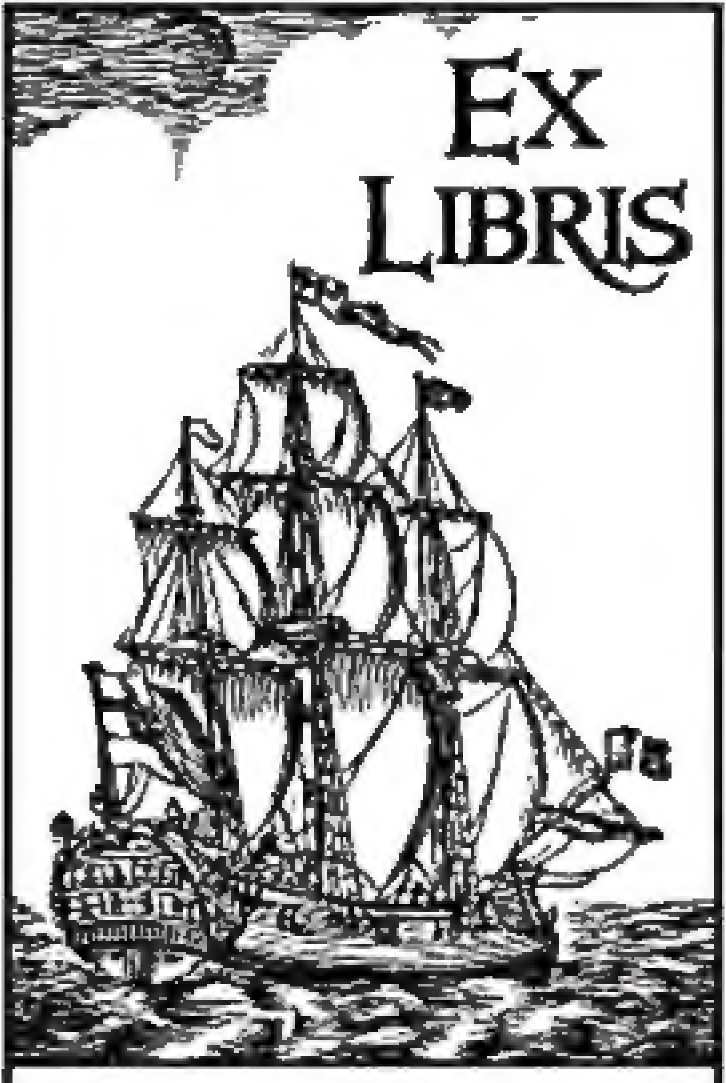

CUT HOLE FOR SPEAKER
DOOR
12½"
9½"
6¼"
6¼"
4½"
8¾"
8"
DIMENSIONS OF PLYWOOD CABINET



Here is the completed Master before installing in the carrying case. Although a workshop job it has all the makings of an expensive manufactured amplifier. For best sound coverage a 12-inch diameter dynamic type speaker is suggested.


NOTE: 6 VOLT LEADS CONNECT TO H-H PRONGS ON TUBE SOCKETS
FILTER CHOKE
POWER TRANSFORMER
6 V.
5 V.
550 V.
H
H
K
F
S
F
P1
P
5Z4
OUTPUT TRANSFORMER
C.T.
P
P
ELECTROLYTIC COND.
VOICE COIL
FIELD COIL
25 MFD.
10,000 OHMS
300 OHMS
2,000 OHMS
10 MFD.
VOICE COIL
SPEAKER
MICROPHONE TRANSFORMER
INPUT
PUSH-PULL INPUT TRANS.
OUTPUT
PRI.
SEC.
6F5
CAP "G"
POWER SWITCH
.1 MFD.
500 OHM LINE
250 OHMS
500,000 VOLUME CONTROL
25 MFD.
6F6
250,000 OHMS
.1 MFD
G2
K
H
S
G
P
G1
6C5
110 VOLTS
CARBON MICROPHONE JACK
PHONOGRAPH PICKUP
CLOSED CIRCUIT JACK
10 MFD.
1,000 OHMS
INDICATES GROUND TO CHASSIS

No advanced radio experience is needed to build the MM Master. The above pictorial diagram shows the exact placement of all the necessary parts.



Ex
Libris

Anon. Malefactor